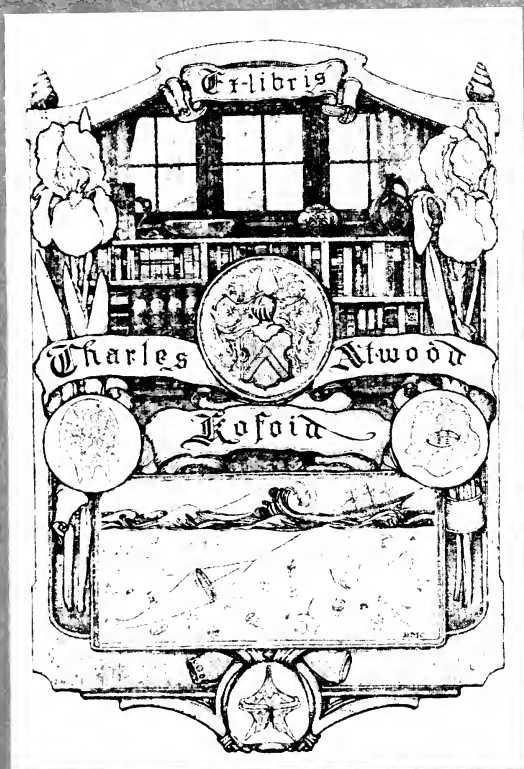
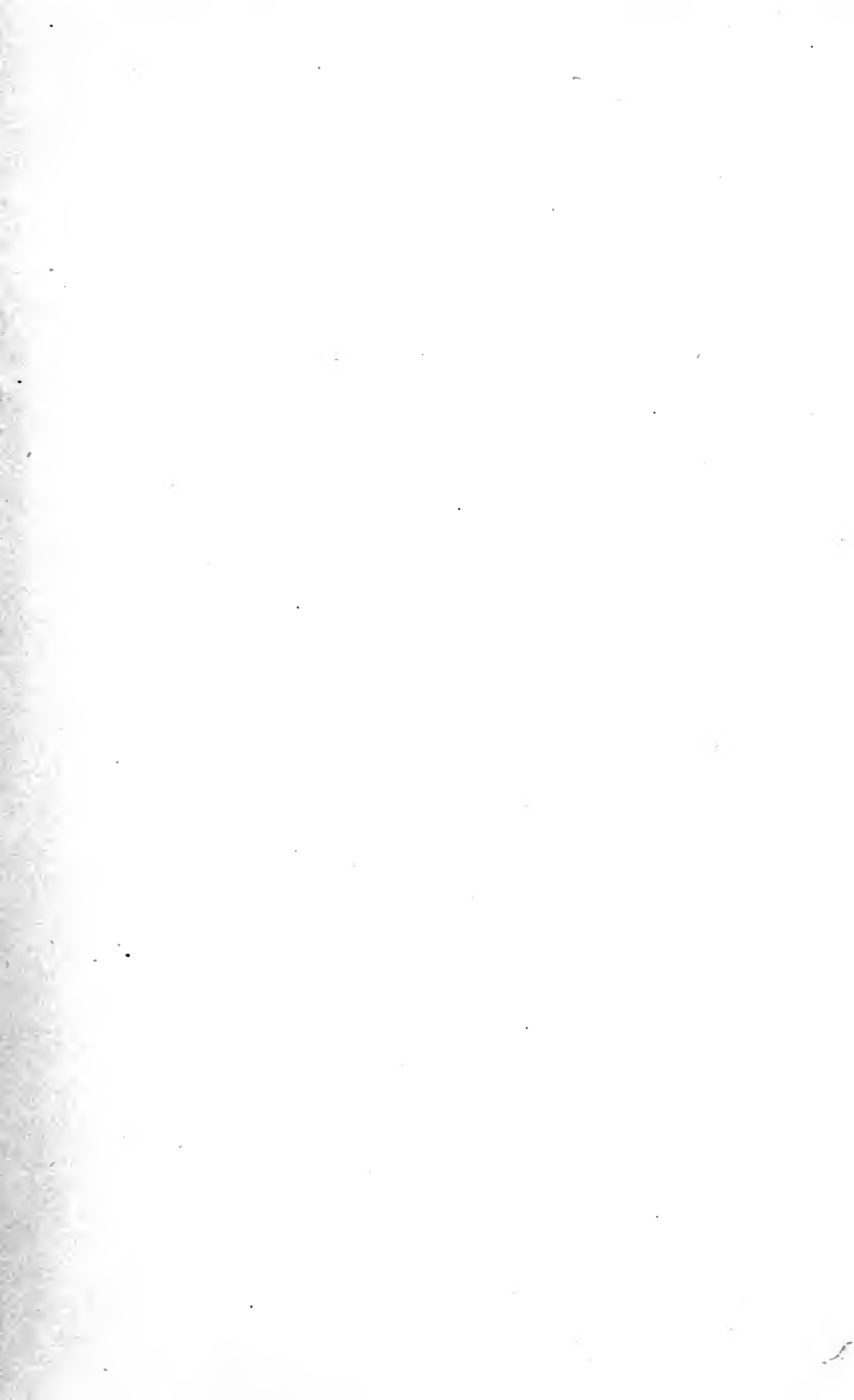


UC-NRLF

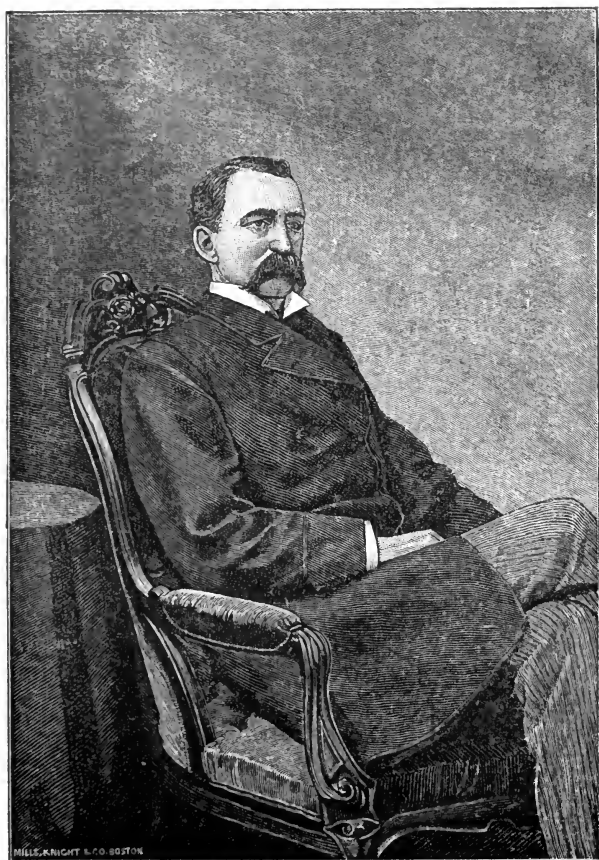


5B 70 586









Yours Respectfully
John M. Bailey

THE BOOK OF ENSILAGE;

OR, THE

NEW DISPENSATION FOR FARMERS.

EXPERIENCE WITH "ENSILAGE" AT "WINNING FARM."

HOW TO PRODUCE MILK FOR ONE CENT PER QUART; BUTTER
FOR TEN CENTS PER POUND; BEEF FOR FOUR CENTS
PER POUND; MUTTON FOR NOTHING IF WOOL
IS THIRTY CENTS PER POUND.

BY JOHN M. BAILEY,

PROPRIETOR OF "WINNING FARM," BILLERICA, MASSACHUSETTS, AND VIRGINIA STOCK
FARM, SUSSEX COUNTY, VIRGINIA.

FARMERS' EDITION.

"I beg to express my gratitude to you for the noble efforts you are making in behalf of the cause of agricultural science. Ensilage is to prove a great blessing to the world. . . . I am very glad that you have given us the results of your experience in so neat a volume, and in so clear a manner, that *he who runs may read*." — MARSHALL P. WILDER.

"A work of incalculable importance to American farmers." — LEVI STOCKBRIDGE, *President Massachusetts Agricultural College*.

"Your 'Book of Ensilage' is received and read through. You seem to have covered the whole subject and lapped around it, — Alpha and Omega. It will be greedily read." — J. B. BROWN, *Translator of M. Goffart's "Ensilage of Maize."*

NEW YORK :
ORANGE JUDD COMPANY,
245 BROADWAY.
1881.

COPYRIGHT, 1880,
By JOHN M. BAILEY.

Press of Mills, Knight & Co., Boston.

INTRODUCTION TO NEW EDITION.

WHEN, in the winter of 1879-80, I took the liberty of dedicating the first edition of the "Book of Ensilage" to the "farmers of America," the system of ensilage, so far as related to its adaptation to America and to American wants and methods, was in that state of uncertainty that no one could be found who dared to thoroughly try it, partly on account of the expense involved, and perhaps more through an unwillingness to run the risk of failure, and consequently be compelled to bear the ridicule of those who stand ready, whenever a progressive man takes a step in advance of the old methods, — in hopes that something better may be found which shall serve to elevate humanity, or lessen the toils and improve the condition of his fellow-man, — to say, until complete success silences them, "I told you so." Could these doubters, these dispensers of ridicule, always have had their own way, and prevented progressive men from *trying*, every farmer would to this day have carried his grist to mill slung across his horse's back, with a stone in one end of the bag to balance the weight of the corn in the other.

The success of my experiments was, however, so complete, the results were so startling, but so conclusive, that thousands of the most intelligent and progressive farmers and businessmen with a taste for agriculture, came to "Winning Farm," and examined the practical workings of the system of ensilage for themselves. So convincing was the exhibition of what they saw, that I can truly say that there is to-day, not a State in the Union which has not a silo constructed in all material points after the "Winning Silos." Nebraska — one of the last we

would suppose to economize forage — can boast of having the largest silos in America, if not in the world. Dr. Eager of Middletown, Orange County, N.Y., visited "Winning Farm" early in the winter of 1879-80, and has constructed at West Point, Neb., four silos, each 60 feet long, 20 feet deep, and 16 feet wide, — capacity about 2,000 tons. California has its silos, as have Florida and Texas. In New England and the Middle States, hundreds have been built. At this date (Dec. 1, 1880) I am in receipt of many letters daily, announcing the openings of silos. *In every case the success is absolute.* Hundreds of successful experiments in 1880 from the one seed sown by me in 1879! No more doubting. Every farmer is considering how he shall build, and where he shall locate, his silos. I do not claim the credit of originating the system of ensilage. No man can claim that; for it is older than the Christian era. We are all under great obligations to M. Auguste Goffart, a distinguished member of the "Central Agricultural Society of France," and "Chevalier de la Legion d'Honneur," who spent years in patient experimentation before success crowned his efforts. I have carefully tested it, and by my success have made "Silo" and "Ensilage" household words in every part of the land. One of the earliest Latin writers speaks of subterranean vaults (silos), wherein the ancient Romans used to preserve fruits, grain, and forage in its green state, in very much the same manner as is practised at this time by Mr. O. B. Potter of Sing Sing, N.Y. The Mexicans have practised the same process for centuries, and to this day preserve the bulk of their forage in the same manner. Probably the idea was carried to Mexico by some learned Spanish monk or priest of a practical and agricultural turn of mind, who, filled with a religious zeal, accompanied the Spanish adventurers in their crusades, which resulted in the subjugation of Mexico, and nearly all the American continent south of it.

If the system was thus introduced into America, whether he was successful or not in teaching the heathen how to save their souls, he certainly taught them how to save their forage.

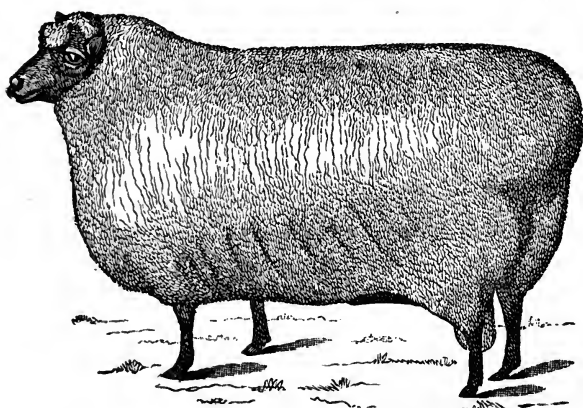
Upon the discovery of America, the Indians in the southern part of our country preserved their stores of maize in pits in

the ground. As the earth is the common mother of us all, so is she the great preserver of all things. The first idea which occurred to the primitive man when he wished to preserve any thing valuable or which he prized was, without doubt, to bury it in the earth.

So that, after all, the *system* of ensilage is not so much a new dispensation as one of the "lost arts," which, after the lapse of centuries, has just been re-discovered, improved, adapted to the requirements of modern civilization, and which is destined to be the means of producing a revolution in our agricultural methods. Allow me, in this introduction to this NEW EDITION, to express my cordial thanks and appreciation of the by far too-flattering notices which "The Book of Ensilage" has received from the press. Editors and reviewers have, with scarce an exception, spoken only to commend, touching but lightly, if at all, upon the faults of style and diction, which are many, realizing that it was a book written by a working farmer in order that that which was hard and perplexing for him to accomplish, with none to advise or instruct, might be made plain and easy to his fellow-farmers. Also to the many gentlemen, eminent in all the walks of life, for the kind and grateful letters in which they have shown their appreciation of my humble efforts to improve the condition of the farmers of America, upon whose prosperity depends not only the well-being of all other classes, but the very stability and permanence of our democratic institutions.

I am grateful also for the success, I see by accounts in the papers, which has attended the efforts of so large a number of those, who, in the early stages of their experiment, solicited and received all the help my experience could render. The possibilities of ensilage can hardly be over-estimated. When I said in my first edition that 40 to 75 tons of green-corn fodder could be raised upon an acre of land, provided proper seed was used, sufficient manure was applied, and the right kind of cultivation bestowed, many doubted, and some ridiculed the statement; "but he laughs best who laughs last;" and I am happy to be able to state that one of my neighbors has raised corn-fodder this year weighing at the rate of 72 tons to the acre, and that his whole

crop averaged over 50 tons to the acre. Some of the stalks were 19 feet 6 inches tall, and weighed 12 pounds each. I have not done as well; but it should be borne in mind that I am experimenting upon an old, run-down farm, which, in 1877, could keep but 6 cows and one horse. I have now in my barn (Dec. 1, 1880) sufficient hay to keep 6 horses, and forage in my silos ample for the sustenance of 40 head of horned cattle, nearly 200 sheep, and 60 swine. I may state also, that, during the past three years, I have bought no hay or manure. This much ensilage has benefited me; and there is no reason why it should not benefit every farmer in like manner. That it may do so, is the earnest wish of my heart.



CONTENTS.

CHAPTER I.

DISADVANTAGES OF THE SYSTEM OF CURING FORAGE BY DESICCATION	11
---	----

CHAPTER II.

DESCRIPTION OF THE "WINNING-FARM" SILOS	16
---	----

CHAPTER III.

FILLING THE SILO	24
----------------------------	----

CHAPTER IV.

OPENING OF THE SILO	28
-------------------------------	----

CHAPTER V.

COST OF KEEPING STOCK UPON ENSILAGE	34
---	----

CHAPTER VI.

TIME WHEN FORAGE PLANTS CONTAIN THE GREATEST AMOUNT OF NUTRITIVE VALUE	39
--	----

CHAPTER VII.

ANALYSIS AND COMPOSITION OF CORN WHEN CUT IN ITS GREEN STATE	42
--	----

CHAPTER VIII.

EXPLANATIONS WHY ENSILAGE MUST KEEP	54
---	----

CHAPTER IX.

ENSILAGE ADAPTED TO WARM AS WELL AS COLD CLIMATES	59
---	----

CHAPTER X.

A NEW DISCOVERY	66
---------------------------	----

CHAPTER XI.

FOOD INGREDIENTS.—CHEMICAL TERMS EXPLAINED	69
--	----

CHAPTER XII.

CAPACITY OF SILOS	71
-----------------------------	----

CHAPTER XIII.

ENSILAGE IN THE GREAT DAIRY DISTRICTS	74
---	----

CHAPTER XIV.

HISTORY OF MAIZE, OR INDIAN CORN	77
--	----

THE IDLENOT PAPERS.

CHAPTER XV.

COST OF PRODUCING MILK ONE CENT A QUART, OF BUTTER TEN CENTS PER POUND, AND OF PORK THREE CENTS PER POUND, BEEF FOR FOUR CENTS A POUND, AND MUTTON FOR NOTHING, IF WOOL IS THIRTY CENTS A POUND	81
---	----

CHAPTER XVI.

SECOND IDLENOT PAPER	90
--------------------------------	----

CHAPTER XVII.

ANALYSIS OF ENSILAGE FROM THE "WINNING-FARM" SILOS	97
--	----

CHAPTER XVIII.

HOW TO PRESERVE GREEN CORN FOR THE TABLE	100
--	-----

CHAPTER XIX.

MY EXPERIENCE WITH SUGAR-BEETS.—COST OF RAISING ONE-FOURTH OF AN ACRE, AND THE YIELD	101
--	-----

CHAPTER XX.

SUMMARY	104
-------------------	-----

CHAPTER XXI.

EFFECT OF ALCOHOLIC FERMENTATION IN ENSILAGE UPON "GILT-EDGED BUTTER"	106
---	-----

CHAPTER XXII.

MODEL DAIRY STABLE ADAPTED TO THE SYSTEM OF ENSILAGE	111
--	-----

CHAPTER XXIII.

CONCLUSION OF THE BOOK OF ENSILAGE	119
--	-----

CHAPTER XXIV.

LATEST RESULTS IN PRESERVING AND FEEDING ENSILAGE	122
---	-----

CHAPTER XXV.

FATTENING STEERS, FEEDING SWINE, METHOD OF FEEDING, WARM WATER FOR STOCK, ETC.	128
--	-----

CHAPTER XXVI.

ILLUSTRATING THE NUTRITIVE VALUE OF ENSILAGE	133
--	-----

CHAPTER XXVII.

CHEMISTRY OF THE SILO	135
---------------------------------	-----

CONTENTS.

9

CHAPTER XXVIII.

HOW TO RAISE THE MAXIMUM CROP OF FODDER CORN 138

CHAPTER XXIX.

NEW FORAGE PLANTS AND NEW USES FOR ENSILAGE. . . . 139

WHAT IS A SILO, AND WHAT IS ENSILAGE ?

This is what the farmers want to know when the "*New Dispensation*, or system of *Ensilage*," is presented to their attention.

A SILO is a cistern or vat, air and water tight on the bottom and sides, with an open top, constructed of masonry or concrete. It may be square, rectangular, round or oval in shape, with perpendicular sides, used to store in their green state forage-crops, such as corn, sorgho, rye, oats, millet, Hungarian grass, clover, and all the grasses. This forage is cut and taken directly from the field, run through a cutter which cuts it into pieces less than half an inch in length, and trampled down solidly in the SILO, and subjected to heavy and continuous pressure.

The structure is the SILO, which may be above ground, or partly or entirely below the surface of the ground. The fodder preserved in SILOS is ENSILAGE.

THE BOOK OF ENSILAGE.

ACCOUNT OF THE "WINNING-FARM" SILOS.

CHAPTER I.

DISADVANTAGES OF THE SYSTEM OF CURING FORAGE BY DESICCATION.

THE great obstacle to raising stock at a profit has always been the high cost of all kinds of fodder for winter feeding. Especially has this been the case in the eastern part of the New England and Middle States. The lowest cost at which a cow can be kept in Eastern Massachusetts is twenty-two cents per day for feed, allowing nothing for care except the manure. This makes the yearly cost of keeping a cow to be at least \$80.30. Many of my fellow farmers who raise milk inform me that it costs them twenty-six cents per day, which raises the cost to \$94.90 per year. To meet the lowest sum \$80.30, at the highest price at which milk has been sold in Eastern Massachusetts during the past few years, viz., twenty-five cents per can of $8\frac{1}{2}$ quarts, each cow would have to yield $321\frac{1}{2}$ cans, or 2,730 quarts, — about 5,500 pounds.

"It goes without saying," that there is not one herd of cows in fifty which averages 5,000 pounds of milk per

head yearly. While this is so, that ninety-eight per cent of the cows yield less value in milk than it costs to feed them, still as a choice of evils farmers are obliged to keep them rather than sell the provender they consume, though it would bring more money than the milk. By gratuitously incorporating a large amount of labor into the milk, they are enabled to keep up the fertility of their farms, while on the other hand were they to sell their forage they would soon impoverish their land.

Paradoxical as it may seem, the only way the majority of farmers near our large cities can make (?) any money is, and has been, to sell milk at less than it cost to produce it! This is a very unsatisfactory condition of affairs.

For several years I have been anxiously looking for science to show us — agricultural laymen — the way out of the wilderness into the promised land, where crops could be grown at a profit *without* the farmer's labor being thrown in as straw — *quantum sufficit* — is when figuring up the cost of wintering stock in the West.

Analyses of the soil at one time promised to bring about a great change in agriculture, by showing us just what the soil lacked to produce bountiful crops of whatever we wish to raise. This proved an *ignis fatuus*, — for nearly all soils were found to contain when chemically analyzed every thing required to produce scores of bountiful crops of almost every thing.

The trouble was, that while the elements of fertility were there *chemically*, they were not there in such a form as the growing plant could avail itself of.

The next great panacea was to analyze the crop which it was proposed to raise, and apply to the soil the various elements found in the crop, principally nitrogen, phos-

phoric acid, and potash. The trouble with this is, that no one can tell except by a series of careful experiments whether one, two, or all three of these elements must be applied to the land in order to raise a satisfactory crop. Having ascertained that a certain crop can be raised upon a certain piece of land by applying one, two, or all three of the above-named elements of fertility; another set of equally careful experiments must be tried whenever a different crop is attempted upon the same land, or the same crop upon another piece of land.

This necessitates the farmers' trying all these experiments upon their own land; which is out of the question, for while they might, they certainly will not do it.

Therefore commercial fertilizers will perforce have to be applied in the future as in the past, mostly at random.

I do not wish to be understood as saying that commercial fertilizers are not valuable and useful in their place; which place is *not to take* the place of barn-cellar manure, but as an economical adjunct to it in the hill and drill.

The chief objection to depending *in the main* upon them is, that in the majority of cases the fertilizer costs more than the crop will bring.

No great agricultural prosperity can come through the increased use of commercial fertilizers, except as aids to barnyard manure.

Experiments in England have demonstrated that the crop does not increase in proportion to the amount of fertilizers applied, even when the most consummate skill directs the operations.

While agriculture has not been benefited to the extent hoped for by the processes mentioned above, there was one man who was patiently experimenting, and endeavoring to solve the problem in an entirely different way.

It has long been apparent to every observer, that there is an immense loss sustained in the manner in which all forage-crops have been cured from time immemorial, viz., by desiccation or drying. While it is agreed by all that a larger proportion of all vegetable growth comes from the atmosphere than from the soil, it does not appear to have struck scientific agriculturists that during the process of curing by drying, a very large proportion of the most valuable elements of nutrition are returned to the atmosphere from whence they came.

“The cow which gives us in summer while feeding on green grass such excellent milk, and butter of such agreeable color and flavor, furnishes us in the winter, — when she eats the same grass converted into hay, — an inferior quality of milk, and pale, insipid butter. What modifications has this grass undergone in changing into hay? These modifications are numerous. It is sufficient to cross a meadow when the new-mown grass is undergoing desiccation, to recognize that it is losing an enormous quantity of its substance that exhales in the air in agreeable odors, but which, if retained in the plant, would serve at least as condiments favoring digestion and assimilation. All stock-raisers know how rapidly young stock increases in weight in summer upon green pastures, and also that the same amount of grass converted into hay and judiciously fed in winter does not always prevent them from shrinking, and seldom gives any increase.

“The loss by desiccation in fine weather under the best conditions, added to that caused by the physical modifications which render mastication and digestion of the hay more difficult than of the grass, and consequently assimilation less complete, merits the most seri-

ous attention on the part of those who are interested in agricultural affairs.

“Rains, and even dews, add immensely to the deterioration inseparable to a process of curing by dessication. What agriculturist has not seen a hundred times his hay, notwithstanding the utmost care, injured by rain, deprived of its richest and most assimilative elements? If these things occur to the common fodder-crops, — timothy, orchard-grass, clover, &c., — what would (or rather, what *does*) happen when the saving of fodder-crops of high growth and great yield, such as maize and sorgho, or even Hungarian grass or millet, is attempted by desiccation? never in our temperate climate could we obtain for these a sufficient desiccation by the sun” when raised on a large scale. I have seen a neighboring farmer working nearly three weeks to cure about an acre of millet, and then it was very imperfectly preserved.

M. Aguste Goffart, whom not only all agriculturists, but the whole world ought to honor as it has no other man, commenced his experiments in preserving fodder by other means than drying, nearly or quite thirty years ago. It is reasonable to suppose that he met with failure after failure; but not discouraged he persevered; and during the last four years has so improved upon his earlier methods, that the preservation of any and all green crops, with all their valuable attributes unimpaired, is no longer an experiment.

I will not take space to describe M. Goffart's Silos and methods; but would recommend all those who wish to investigate the French system to send to J. B. Brown, Esq., No. 55 Beekman Street, New York (the translator of M. Goffart's treatise) for a copy of “*Ensilage of Maize*,” and study it.

CHAPTER II.

DESCRIPTION OF THE "WINNING-FARM" SILOS.

I WAITED long in hopes that one of our agricultural colleges or experimental stations would take the initiative.

The following letters convinced me that there was no use in waiting for more half-way experiments to be tried, where "half of the fodder went to waste," and the balance was so imperfectly preserved that it was "very difficult to remove the peculiar and very disagreeable smell from the hands after touching it : " —

NEW YORK, July 26, 1879.

JOHN M. BAILEY, ESQ.

Dear Sir, — . . . Can you not effect a combination, and build a Silo of masonry, and make a business of it this fall? I have not yet heard of any one who is going to do it thoroughly. . . . I speak of combination, as all seem to be afraid to do it right on account of the expense. I don't think any thing but masonry is sure, and that is. . . . I have urged all the enterprising and competent farmers I am acquainted with to be the *first* to do it on Goffart's plan, but I have not succeeded as far as I now know.

Yours truly,

J. B. BROWN.

If any thing was necessary to convince me that I must depend upon myself, this letter was enough. Mr. Brown knew of Mr. Francis Morris's experiments and their unsatisfactory results; hence his anxiety that I should test

the system in a thorough manner: therefore I resolved to brave the danger of being "laughed at;" and as no one could be induced to try the great experiment, and that the public should not lose the benefit of a system of such vast importance to the welfare of our nation, and fearing also that the grand discovery of M. Goffart's might fall into disrepute in consequence of not being tried in a thorough and scientific manner, I decided to make the experiment.

For several years I have been trying to find the way to raise profitable crops, or to turn them to profitable account when raised. I eagerly scanned every item which appeared in the public press bearing upon the process of preserving forage-crops in their green state. All the plans seemed to give but imperfect results; nevertheless, there seemed to be value in the *idea*.

It was therefore with pleasure I saw a notice of Mr. Brown's translation of M. Goffart's work upon "Ensilage." I sent for it. Upon a careful perusal of the work, and some little discussion in the columns of "The Country Gentleman" with Mr. Brown upon some parts of it, I became satisfied that the principle was right, that M. Goffart's method—with such modifications as climatic differences demand—faithfully carried out, would bring success.

Having resolved to try the experiment thoroughly, on the seventeenth day of July, 1879, I broke ground, selecting a side hill, and locating the Silos so that the corner joined the north-east corner of my barn: I excavated on the west side and south end seven feet deep, and put in a solid stone wall on the west side, 44 feet long and 12 feet high. This was built of very heavy stone and in the most substantial manner.

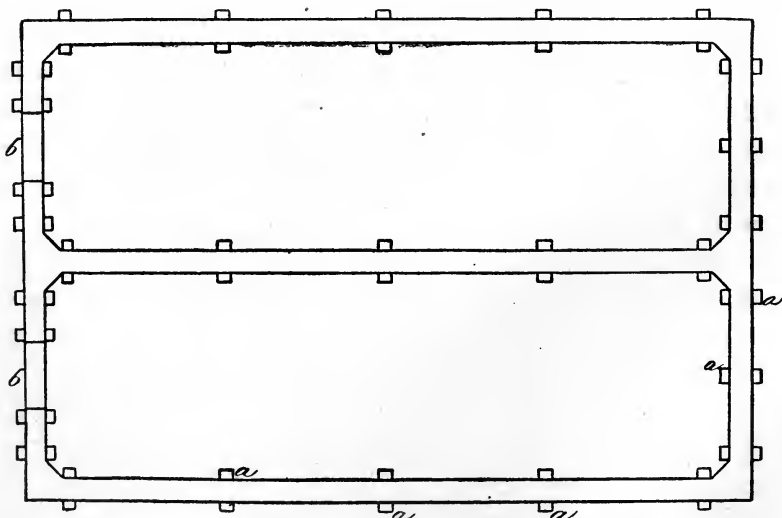
I afterwards graded up on this side to the top of the

wall, making a level spot to set an engine and Ensilage cutter upon; also to drive upon to deposit the corn fodder as it came from the fields on dump-carts. It took 13 days' work of a stone-mason, $43\frac{3}{4}$ days' work of laborers, and $28\frac{1}{2}$ days' work for one horse, to excavate and build the stone wall and foundations for the Silos.

On the tenth day of August I commenced building the Silo walls. These are 15 inches thick, built of concrete in the following manner.

First, 3×4 joists are set up at each of the angles, and also at intervals of about eight feet on each side of the walls. These scantling are placed 18 inches apart, spruce plank 12 inches wide and $1\frac{1}{2}$ inches thick are set up on the inside of the scantling, which leaves 15 inches between the planks as the thickness of the walls.

We are now ready to commence building the Silo walls. The concrete is made by mixing one barrel of



aa. — 3×4 inch scantling, to hold $1\frac{1}{2}$ inch plank while building wall.
bb. — Doors.

Newark, Rosendale, or Akron cement, with three barrels of plastering sand and four barrels of clean gravel. This is thoroughly mixed together while dry. It is then wet and thoroughly mixed again, making a very thin mortar.

About three inches in depth of this mixture is put in between the planks; then stone of all sizes and shapes are packed and bedded in this layer of concrete, after which another layer of concrete is poured in on top of this layer of stones, and the operation is repeated until the space between the planks all round each Silo is filled; then the planks are raised about ten inches, and the space filled with concrete and stones as before until the walls are at the desired height. The best way is to have a sufficient number of hands to just raise the wall the width of the plank each day. Time was pressing with me, however; and I sometimes raised the plank two and three times in one day, the concrete "setting" so that I was able to do so safely. But I do not recommend this haste, as the walls will not be as smooth as they would be if the cement had all night to "set" in before the planks were raised. A 4×12 inch sill was bedded on the wall in the last layer of concrete. This sill was made of 2×12 inch spruce plank nailed together. Upon these sills a building was placed with posts five feet high, the beams on the top of these posts being thoroughly braced to the posts, thus firmly tying the whole structure together.

In sections of the country where clean sand, gravel, or stone is not easily obtained, Silo walls may be constructed of brick in the usual manner of brick buildings.

To put up the concrete walls and bed the sills, together with grading the upper side, where the cutting of the fodder is done, took of the foreman $28\frac{1}{2}$ days,

work of laborers 149 days, and 34 days' work of one horse. Putting up the frame to hold the plank took two carpenters two days. It required 124 barrels of cement, costing \$1.25 per barrel in Lowell. The teaming of the cement and lumber is included in the above account of time of horses and laborers. The cost of the whole structure will of course vary in different locations, as the cost of labor and materials varies.

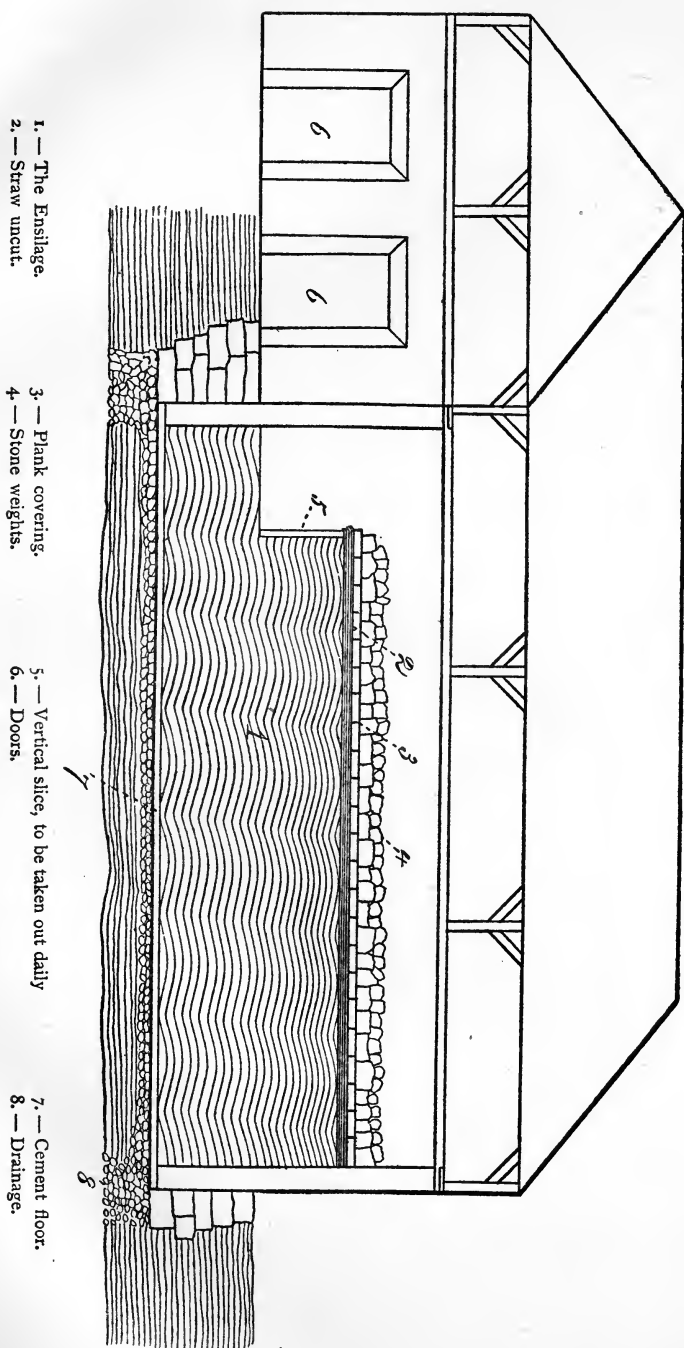
My Silos (capacity about 800,000 pounds) cost me about \$500. In other words, Silos will cost about one dollar and a quarter for each ton's capacity. Large ones will cost less, small ones more. The following diagram illustrates my Silos.

Silos may be built of stone pointed with cement mortar and plastered on the inside, or of brick, or of concrete as mine are. Whichever material is the cheapest and most convenient in any locality is the best to use there. Brick will cost more than the concrete. Concrete wall costs about ten cents per cubic foot.

As a general rule, Silos should be built rectangular in form, the width being about one-third the length, and the height about two-fifths of the length, and if possible should be sunk about one-half below the surface of the ground.

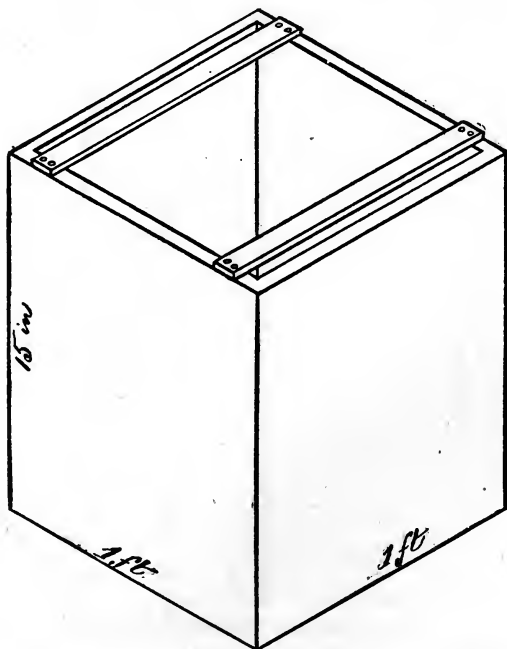
If there is a side hill near the stables, so that the surface of the earth will come nearly to the top of the walls at one end of the Silos, it will be found very convenient in filling the Silos, in weighting the Ensilage, and in removing the weights as it is fed out.

These walls must be built sufficiently strong to withstand when empty the pressure of the earth inward, as well as the pressure outward, caused by the settling of the Ensilage under the superimposed weights placed upon it.



Where it is not convenient to get stone for weights, heavy logs of wood may be used, sawed in pieces about three feet in length, and placed on end all over the planks which cover the Ensilage; three feet of wood being about equal in weight to one foot of stone. Or broken bricks may be obtained at the brickyards at a nominal price. Where neither of the above is available, bags or boxes of earth may be used as weights. Where boxes of earth are used, they should be made of such a size as to fit close together side by side.

M. Goffart recommends that the corners be rounded. I thought that cutting them off, as shown in the diagram, would answer as well and be much less expensive. I find, upon opening the Silo, that the Ensilage is pre-



Earth-box for weights, showing convenient handles which will not interfere with piling the boxes when removed.

served as well and settled as evenly in these corners as elsewhere ; also that the preservation is just as perfect close to the walls as in the centre, showing that a concrete wall is more impervious to air than a brick one.

CHAPTER III.

FILLING THE SILO.

I COMMENCED cutting my green-corn fodder on Sept. 22, and finished putting on the stone for weight at three o'clock P.M., Sept. 30, putting in about two feet in depth daily. This is fast enough; for the shrinkage will then be much less when the weights are put on than it would be were the Silo filled faster.

The seven acres of corn-fodder filled one Silo to within about $5\frac{1}{2}$ feet from the top. Upon the top of the Ensilage I put about one foot of rye straw uncut. Then I commenced at one end, and floored it over by laying $1\frac{1}{4}$ inch spruce plank crosswise the entire length. Upon this floor I put about 25 tons of bowlders. I am not sure that the straw is necessary: further experiments will decide. I shall use less next season.

The Ensilage settled about $1\frac{1}{2}$ feet. There has been no odor or steam arising from it. The cost of cutting the corn up, hauling it to the cutter, cutting it $\frac{4}{10}$ of an inch long, and packing it in the Silo, was not far from 75 cents per ton.

It was new work. The cutter was not adapted to the business, clogging badly and necessitating slow feeding. All this combined to make it cost more than it will when we become used to the work of handling large amounts of green-corn fodder.

The corn-fodder can be cut in the field with corn-knives cheaper than by the mowing-machine. The men as they cut it lay it in bunches; for it is much easier for the drivers to load it when laid in bunches, than to gather it up after the mowing-machine. The extra cost in cutting is more than made up by the expedition in loading and hauling.

I think the cost of Ensilaging 300 to 400 tons, when we have the right kind of a cutter (Baldwin's American fodder-cutter all sizes, adapted to large as well as small farmers, substantially built and at reasonable prices, is the best one I have seen: they are manufactured for, and are for sale by, Joseph Breck & Sons, the old and reliable seedsmen and dealers in all kinds of agricultural implements, Boston, Mass.: I have bought seeds and tools of them for many years, and have always found them reliable and trustworthy), will not exceed 40 cents per ton. This is less than it would cost to go to the field, and cut and haul it into the barn; and, after it is in the barn, the labor of feeding the *whole* fodder is much more than to fill a basket in the Silo and give it to each animal. Therefore it is cheaper to cut up the whole crop at one time, put it in the Silos, and feed it from them to the stock even in summer, than to go to the field for it as it is wanted.

Now, when it is considered that the corn-plant is at its *best* but a few days; that it can *all* be put into Silos when in the best condition; and that, notwithstanding great care in successive plantings, if used directly from the fields, much has to be fed either in an immature state, or when too hard for the cattle to masticate the stalks, — it will be seen that the saving, however considerable in planting as well as harvesting the whole crop at one time, is but a trifle compared to the gain in nutri-

tive value by being all cut at the right stage of growth, and preserved by the system of Ensilage with all its elements uninjured.

Ensilage is therefore the most economical method of soiling. The preserved succulent forage is improved by lying in the Silos, and at the same time the easiest and cheapest road by which green crops can reach the manger is through the Silo. It practically annihilates winter, and places the stock-raisers and dairymen in better circumstances than they would be if they had throughout the year the waving fields of oats or rye and the luxuriant corn in their best stage for soiling, from which to cut the daily food of their animals. The advantage of being able to plant or sow the whole crop at one time, and to cut and store it all at once, when in its most nutritive state, can hardly be over-estimated.

My corn was planted from the 15th to the 25th of June. On one acre was Stowel's evergreen sweet corn; the other six acres, Southern white corn.

There were at least twice as many tons of the latter to the acre as of the former. I shall plant no more sweet corn for Ensilage. The corn was all sown in drills about three feet apart, one bushel of seed-corn to the acre; was manured with about six cords of stable manure spread broadcast after ploughing, and harrowed twice with a Thomas smoothing harrow. It was planted with an "Albany corn-planter;" which, in addition to opening the drill, dropping the corn, and covering it, also deposited about two hundred pounds to the acre of a mixture composed of equal parts of superphosphate, cotton-seed, meal, and gypsum. A portion did not come up well, and had to be replanted. The dry weather and cool nights of the summer of 1879 prevented a rapid growth in certain portions. In fact, it was not a good

corn year, so that the crop was somewhat uneven at harvesting. The leaves at the bottom of the stalks had largely become dry and dead, and a sharp frost when the cutting was about half finished injured somewhat the leaves on that portion still standing in the field. Some of the stalks had ears large enough for roasting; and the whole of it, I think, was rather too mature.

There was estimated to be in the Silo when opened 125 tons. The crop was very uneven, some parts having at least 40 tons to the acre. Upon other parts, where the drought affected that which was replanted, the yield was not over 10 tons per acre. I do not think it will be at all difficult to raise 40 to 75 tons per acre upon an average on good corn-land. It should be planted from the 1st to the 10th of June. It will then be in full blossom, and in the best condition to cut, by the last of August and before any frost can injure it.

As stated above, the cutting was finished on the 30th of September. It was decided to open it on the third day of December; and, as the condition of the Ensilaged maize was a question of the utmost importance, it was, upon the suggestion of Mr. Brown, decided to have the "opening of the Winning-Farm Silos" a public matter "*as the American Initiative.*"

Accordingly invitations were sent to quite a number of gentlemen, well known for their interest in agriculture, as well as for the benefit they have conferred upon the whole country in the untiring efforts they have made to improve not only our system of cultivation, but our domestic breeds of cattle and all the fruits of the earth which minister to the wants and add to the pleasures of mankind.

CHAPTER IV.

OPENING OF THE SILO.

UNFORTUNATELY the meetings of the State Board of Agriculture and the Massachusetts State Dairy Fair, were held on the same day as the opening, which prevented the attendance of many gentlemen, who, however, sent letters of regret expressing great interest in the result.

The following letter was received from the United States Commissioner of Agriculture:—

DEPARTMENT OF AGRICULTURE, WASHINGTON, Nov. 23, 1879.

J. B. BROWN, 50 *Beekman Street, New York.*

Dear Sir,—I am much gratified to receive and thank you for the invitation to attend the opening of the FIRST American Silo at the farm of Mr. John M. Bailey at Billerica, Mass.

As Congress will be in session at the time mentioned, it will not be possible for me to attend, a fact which I regret very much. Will you have the kindness to convey to Mr. Bailey my sincere regrets, and ask him to give me a detailed statement of the experiment from beginning to end, for publication in my next annual report?

I look upon the system of Ensilage as one which has wrought wonderful changes in certain French provinces, and from which we may hope for greater success in this country.

It will prove, I have little doubt, a very decided advance in our agricultural methods.

Very respectfully yours,

WM. G. LE DUC, *Commissioner.*

The following letter from Hon. Marshall P. Wilder shows us that neither his advanced age, nor the painful accident from which we all rejoice to know he is rapidly recovering, has diminished his interest in all that pertains to an improved agriculture : —

BOSTON, Dec. 2, 1879.

My dear Sir, — I would be glad to be at the "Winning reception" to-morrow, but I am not sufficiently recovered to take the journey. With thanks for your kind invitation,

I am yours as ever,

MR. BAILEY.

MARSHALL P. WILDER.

RAMSEY'S, BERGEN COUNTY, N.J., Nov. 27, 1879.

MR. J. B. BROWN.

My dear Sir, — In reply to your letter of the 19th inst., I regret to say that I shall leave in a few days for California, and am therefore unable to accept the invitation of Mr. Bailey to be present at the opening of his Silo of 120 tons of "Ensilage," on the 3d of December, on his farm at Billerica, Mass.

I have no doubt that the preservation of corn-stalks green for winter fodder will soon become the great resource of our farmers, giving, as it will, increased remuneration to agricultural industry.

Mr. Bailey is to be congratulated upon giving the FIRST public exhibition of Ensilage, which promises such important changes.

I am confident, from the investigation I have given the subject, that it will be a convincing showing of its great national value to all present. I have felt for the last three years that I could render no greater benefit to my neighbors, than to direct their attention to this system of husbandry.

I am, with great respect, your obedient servant,

RODMAN M. PRICE.

MORETON FARM, ROCHESTER, N.Y., Dec. 2, 1879.

JOHN M. BAILEY.

Dear Sir, — I received your kind invitation to be with you to-morrow. Nothing would please me better ; but I am so busy with my seeds, that it will be impossible to spare the time.

I think you have struck the right idea.

Respectfully yours,

JOS. HARRIS.

Letters were also received from the agricultural editors of the "New York Tribune," "New York World," "Land and Home," and other journals, asking for information as to the experiment; and also from Professors Stockbridge, Goessmann, and Maynard, Richard Goodman, Esq., H. H. Commins, Esq., William H. Bowker, Esq., T. G. Huntington, O. A. Hillman, S. C. Stone, and many others interested in agricultural developments.

Mr. J. B. Brown, President of the "New York Plough Company," and translator of M. Goffart's book, was present; and there were quite a large number of gentlemen from New York and the New England States.

After briefly looking at the Berkshire swine, Oxfordshire-down and Cotswold sheep, and Jersey and short-horn cattle, the company repaired to the Silos; and to say that there was a good deal of anxiety felt while the stones and spruce plank were being removed for the space of about three feet at one end of the Silo, would be stating no untruth.

The top and edge of the Ensilage next the door for two or three inches, was somewhat musty, and in places almost rotten. But directly below this the fodder came out cool, soft, moist, and wholesome looking, with a strong alcoholic odor, and quite acid. It was evident that fermentation had been going on until acetic acid had been formed.

The following from the report of the editor of "The Lowell Journal," who was present, will describe the impression received by those present at the "opening:" —

"There was, however, no unpleasant taste, except the acidity, and no unpleasant smell.

"There were twenty or thirty head of cattle on the farm, as well as sheep, swine, and horses. They were all given some of the Ensilage.

"The hogs ate it greedily. The sheep also seemed very fond of it.

The neat stock were not so eager for it at first; but most of them seemed after a while to acquire a taste for it, and soon manifested a desire for more.

"There were spots where the fodder was not so sour; but it was evident that it did not come out the sweet, fresh, and palatable fodder which has been secured in the French Silos.

"The reasons which may be ascribed for this are various. Mr. Brown thought it was due to the maturity of the fodder when cut.

"It may be that being just at the upper corner, near the door, the preservation from oxygen was less perfect than will prove to have been the case farther down in the mass.

"The numerous dry and dead leaves caused by the drought and frost may possibly have something to do with it. We shall know more about this as the Silo is emptied.

"One thing is certain thus far: the fodder is *so well* preserved that the cattle *will eat it*, and there is no question but that they will *thrive on it*.

"Since writing the above we have received a note from Mr. Bailey, dated Dec. 5, in which he says, —

"Yesterday morning we fed what Ensilage was taken from the Silo while you were here. All of the animals but four ate it all, licking out their mangers clean. The four finally ate theirs up before noon. This morning we fed about a bushel to each grown animal, and a proportionate feed to younger ones. I am pleased to state that they have all eaten it up clean. The acidity appears to be much less than when first opened, and there is emitted — as there should be — a strong alcoholic odor. I think that under the circumstances we can claim it as a perfect success.'"

There can be no doubt that the cause of this acidity, and the alcoholic odor in the Ensilage, is on account of the stalks being too mature before cutting.

Professor Goessmann writes that "acetic acid had formed in the stalks before they were cut."

If cut at the period of blossoming, but very little acetic fermentation will take place in the Silo, and no alcoholic fermentation until after it has been exposed in a large pile to the action of the atmosphere.

I think there is always more or less acidity present.

From a report to the Central Agricultural Society of France by a "committee of the sections on live stock, physico-chemical and high cultivation," upon the subject of the "Ensilage of green-cut corn-fodder séance, April 7, 1875," I make the following extract:—

"The fodder has an alcoholic odor quite marked and slightly acid. It is eaten with avidity by the cows, and constituted their sole food since the commencement of winter. We were struck by the hearty appearance of the 28 or 30 cows. Their eyes were bright, their skins soft, and they are in good condition. (Goffart's 'Ensilage of Maize.')

On the 9th of December the following report was made to "The Country Gentleman":—

ENSILAGE IN MASSACHUSETTS.

EDITORS COUNTRY GENTLEMAN:—

The "Winning Farm Silos" are a perfect success. The preserved corn-fodder which was cut about $\frac{4}{10}$ of an inch long, and placed in the Silo about the last of September, and subjected to heavy and continuous pressure, is being fed to the stock. They all eat it with avidity. Its preservation is perfect. It has an alcoholic odor, and is somewhat acid. My stock eat it all, lick out their mangers, and look wistfully for more. When the Silo was first opened, Dec. 3, there appeared to be a strong acidity, so much so that some of the gentlemen present were somewhat disappointed; but as we get farther into the mass of Ensilage the acidity is much less, while the alcoholic odor upon exposure to the air several hours is much stronger.

I tried a little experiment with it this afternoon. I had a pen of seven Oxfordshire-downs, and another pen of five maple-shade Cotswolds. They had just been fed with some clean bright hay. In another feed-trough I put some Ensilage. Five of the seven Oxfordshire-downs left the hay, and ate the Ensilage, and four of the five Cotswolds left their hay and did likewise.

I feed, in place of the ration of hay, 25 to 30 pounds of Ensilage to each cow in the morning, and the same at night, which has lain upon the barn-floor all night, during which time fermentation is quite active so that it is warm in the morning.

The Ensilage in the Silo which is compacted, although exposed to

the air seems to undergo no change. It is pressed so hard that the air cannot enter, and therefore does not affect it at all. I am delighted with the success of the enterprise.

I believe it is possible to keep four cows a year upon corn fodder Ensilage raised upon one acre of land. Verily we are under the greatest obligation to M. Goffart, and to J. B. Brown ; to the former for demonstrating to our satisfaction that corn-fodder can be successfully preserved in this manner, and to the latter for *translating* M. Goffart's work into English so that we may profit by his great success. If he is truly blest who "causes two blades of grass to grow where only one grew before," how much more to be honored is this man who has taught us how to keep four cows upon an acre of land where one cow would find but scanty subsistence before ! A most fortunate agricultural revolution is indeed impending, and one which I trust many of our progressive farmers will engage in during the coming season.

JOHN M. BAILEY.

"WINNING FARM," BILLERICA, MASS.

CHAPTER V.

COST OF KEEPING STOCK UPON ENSILAGE.

THE following statement from a gentleman whose estate joins "Winning Farm" will be read with interest.

JOHN M. BAILEY, ESQ.,
Winning Farm, Billerica, Mass.

Dear Sir,—In accordance with my suggestions made on the occasion of the opening of your Silo, Dec. 3, I have used your Ensilage in manner as follows. My small herd of six cows calved early in the spring, viz., in the months of March and April. They are of the ordinary New England stock, with no pretensions to any pedigree. I sell no milk; and my cows, such as they are, were selected more for their butter-making qualities than for any extra milking properties. These cows had served through the season for butter-making, and with the commencement of cold weather and the stoppage of "fall feed" had begun to shrink in milk.

Previous to the use of your Ensilage, the six cows had been fed two bushels of flat turnips, with four quarts of bran to each cow daily, and what dry corn-fodder they would eat. The amount of milk given by them daily was 30 quarts, from which 18 pounds of butter were made per week.

I commenced using your Ensilage on Wednesday, Dec. 10, and left off using it on the 17th, feeding 18 barrels, or 54 bushels, during the week. All but one cow took to the fodder at first kindly, and their appetite for it increased from day to day. There was an increase of milk from 30 quarts to 35 quarts daily. The cream was thicker, of richer color, and of better quality, than from their previous feeding. One sack of bran of the value of 90 cents was all that the cows ate dur-

ing the week in addition to your Ensilage, except a small amount of bog or meadow hay of nominal value.

The account for this week would therefore be for the six cows : —

54 bushels Ensilage (1,620 lbs.), @ \$.001	. . . . .	\$1.62
1 bag wheat shorts	. . . . .	.90
		<hr/>
		\$2.52

The cows should be credited with 22 pounds of butter at 35 cents a pound, and say 210 quarts of skim-milk at one cent per quart, which I consider its value as feed for the pigs.

22 pounds butter, @ \$.35	. . . . .	\$7.70
210 quarts skim-milk .01	. . . . .	2.10
		<hr/>
		\$9.80
Cost of keeping	. . . . .	2.52
		<hr/>
Profit	. . . . .	\$7.28

The flavor of the butter was excellent, and its color a good yellow equal to that which sweet pasture gives.

In the above brief statement I have confined myself strictly to facts, and will make no comments, except to say that I am convinced that your method of preserving green fodder for use in winter time is a success, and will eventually be adopted in this part of the country.

HENRY B. JUDKINS.

Since receiving the above, Mr. Judkins informs me that his cows shrank so that they gave but 20 quarts daily, three days after resuming dry feed.

This is about what they would have shrunk to by this time, had the natural shrinkage not been arrested and an increase caused by the one week's feed of Ensilage.

I have a Jersey heifer 20 months old which has doubled her yield of milk since I began to feed Ensilage. I have one cow 13 years old which came in Dec. 1, three weeks ago. She is now giving 16 quarts daily upon 60 pounds of Ensilage and four quarts of shorts. I am feeding 35 head of cattle and 100 head of sheep upon 45 bushels (about 1,350 pounds) of Ensilage, and 80 cents'

worth of shorts, and less than 50 pounds of hay daily. I cannot make the cost of corn Ensilage to be more than *one mill* per pound, or \$2 per ton.

It will, therefore, be seen that the expense of keeping 35 horned animals and 100 sheep at "Winning Farm" is as follows:—

1,350 pounds of Ensilage @ \$.001	. . .	\$1.35
90 pounds of shorts	. . .	.80
50 pounds of hay @ \$15 per ton	. . .	.37½
Total cost per day	. . .	\$2.52½

The cost of keeping the above stock upon hay and grain would be as follows:—

20 pounds of hay to each animal (ten yearlings counted as five cows), making 30 head, would require daily as follows:—

600 pounds of hay for cattle, at \$15 per ton.	. . .	\$4 50
200 pounds of hay for 100 sheep.	. . .	1 50
120 pounds of shorts for cattle, at \$18 per ton	. . .	1 08
40 pounds of shorts for sheep	. . .	36
Total cost of keeping 30 cattle and 100 sheep per day on hay and grain	. . .	\$7 44
Cost of keeping the above on Ensilage as above	. . .	2 52½
Daily balance in favor of Ensilage	. . .	\$4 91½

From my experience in feeding so far, I consider Ensilage to be worth one-half as much as the best timothy hay. I would not, however, exchange Ensilage for hay and give two tons for one. I believe that 40 to 75 tons of corn-fodder can easily be raised upon an acre, which if properly Ensilaged will be equal to from 20 to 37½ tons of hay. To receive the fullest benefit, however, I think there should be some nitrogenous food, such as oats, shorts, pea or bean meal, oil meal or animal meal, fed with the Ensilage.

Judging from the appearance and the droppings of my animals, I believe they are fed as high as young and breeding stock should be fed.

There is another advantage: after the corn is cut and put into the Silo, — the last of August or first of September, — the land can then be ploughed, and sown with winter rye. The summer, fall, and winter accumulations of manure can be hauled out, and spread broadcast upon the rye at any time after it is sown, during the fall and winter months or early spring. The rye will be in blossom, and ready to cut, between the 10th and 25th of May, and should be cut $\frac{4}{10}$ of an inch long, and put into the Silo in the same manner as the corn fodder.

Land highly manured ought to give ten tons of green rye for Ensilage per acre. The manure having been applied to the land during the time it was occupied by the rye, nothing remains but to plough in the rye stubble, and drill in the corn. Thus 40 to 75 tons of Ensilage can be easily raised from one acre of good corn-land.

I roll my fodder-corn land as soon as planted, harrow with a Thomas smoothing-harrow just as it is pricking through the ground, and once every week or ten days until it is about a foot high. Then, if there appear any weeds, I go through it once with a horse-hoe. I like the Centennial horse-hoe, manufactured by Timothy B. Hussey, North Berwick, Me., best of any I have tried.

In conclusion, let me urge every farmer, who can, to build a Silo. They will have to build sheds to accommodate the stock they will be able to keep. Silos and cheap cattle-sheds are much cheaper than expensive hay-barns.

No manure-cellars are needed. Cement the floors of the cattle-sheds (it costs less than a plank floor), so as

to save all the manure, both solid and liquid ; bed them with leaves, meadow hay, or any kind of hay, for that matter.

Apply the manure as it is made, broadcast upon the rye fields. The land will continually grow richer, the crops of rye and corn fodder heavier. The stock upon the farm will increase in number and value until agriculture will become the most profitable as well as the noblest avocation which shall engage the attention of intelligent and refined manhood.

The foregoing was—it will be seen—written at intervals, from the time of opening the Silo until about the third day of January, when I went to Virginia to visit my stock farm in Sussex County. A month had elapsed since I first began to feed the Ensilage, and I was absent from “Winning Farm” about a month.

Although letters from my manager had informed me from time to time that “the Ensilage works better every day,” still I was unprepared to see such an improvement in the general appearance of the stock. They looked as if they had been at pasture with feed up to their eyes, sleek and smooth. Hundreds of people have visited “Winning Farm” during the winter to see the Silos, and examine the stock fed upon Ensilage. All expressed the same surprise and delight at their appearance. It is all eaten, not a pound is wasted : sheep, hogs, cattle and horses, all like it. Sheep seem to be as fond of it as they are of oats. In January I purchased the maple-shade flock of Cotswolds, or, at least, all the best ewes in the flock. Since their arrival at “Winning Farm” they have been fed Ensilage daily.

CHAPTER VI.

TIME WHEN FORAGE PLANTS CONTAIN THE GREATEST AMOUNT OF NUTRITIVE VALUE.

A GREAT advance has been made within a few years in agricultural knowledge; and among the most valuable facts learned has been this, that grass contains a greater amount of nutrition when in blossom than at any time before or afterwards.

What is true of the common grasses, viz., timothy, red-top, orchard-grass, and clover, is equally true of corn, which is but a gigantic grass.

If, then, a stalk of corn contains at the time it blossoms more nutritive value than at any subsequent time, how foolish and wasteful to let it stand for the ear to form at the expense of the stalk, while at the same time great loss is going on from the leaves and the stalk, as is the case with other and smaller grasses.

The seed formed in the head of a stalk of timothy or other grass — while very rich and nutritious in itself — does not by any means compensate for the loss which has been sustained by the stalk and leaves while the seed is forming and ripening.

The loss which is sustained in the ripening process is not all. By expending a great amount of labor the corn is shucked and put in the cribs. There it suffers more or less from the depredations of rats, mice, and other vermin.

We re-shock or stack the corn-fodder. If we hope or expect to induce our cattle to eat much of the stover, we must cut it with a powerful cutter; next the corn must be ground, and carefully mixed with the cut corn-fodder. Then it must be steamed; and after all this labor and expense the stock will nose it about in their mangers, and leave enough of it to keep themselves well bedded. Now what do we accomplish by all this shucking, cribbing, grinding, cutting of the fodder, mixing and steaming? Why, we have been getting up a very poor quality of "Ensilage"!

After the stalks and leaves had become almost worthless by exposure to the rains and dews while the ripening of the ears was being accomplished, we then, by an expensive, laborious, and roundabout way, try with all the appliances of steam and machinery to get the corn *back into the stalks* so that we can induce our cattle to eat them.

Why not take and preserve the plant when its nutritive value is the greatest? when all its valuable elements are mixed and blended in an harmonious whole exactly adapted for the healthy sustenance of our domestic animals, by that Master Chemist whose handiwork as seen in the tiniest leaf is so far in advance of our most skilful combinations that we can never even hope to comprehend *how* it was formed from the original elements.

It will be almost unnecessary to state that this system of preserving corn-fodder is equally well adapted to all the grasses, clover, Hungarian grass, millet, pea and bean vines, and, in fact, to all kinds of forage-crops, particularly heavy crops of aftermath, which it is often impossible to cure by drying, owing to the lateness of the season, the sun by the obliquity of its rays having lost much of its potency.

There is no doubt in my mind that there is more *available* nutrition in a kernel of grain when it is fully grown, before it has had time to harden, before a part of its substance has been converted into a hard, tough envelope which is almost indigestible, than at any subsequent time. This hard protecting envelope is a wise and providential provision to protect the kernel as a *seed* for future crops. Heretofore no means have been known to preserve grain except by ripening and drying, nor to cure forage crops except by drying: since Ensilage has been proved practical, we may now harvest all our crops when they contain the greatest available amount of assimilable nutritive elements, and preserve them unimpaired indefinitely. In this view of the object of *ripening* grain, the conclusion is irresistible that the nutritive acme in corn and other grain is to be found at or before the blossoming period, as it is in the grasses.

It is by no means certain, so far as the *kernel* of grain itself is concerned, that the ripened grain contains as large an amount of available nutritive elements as it does when in the milk. I have often observed that pigs when fed upon soft corn grow better than when fed upon old corn. Experiments in feeding swine at the West, reported in "The National Live Stock Journal," show this. In the August number I find the following:—

"There is no article of food for swine, available to the ordinary farmer, that will fatten hogs so rapidly as green corn. Its use may be commenced just as soon as the kernels are fairly filled with 'milk;' and the gain that young pigs, as well as mature hogs, will make upon this food is surprising: In preparing swine for exhibition at the autumn fairs, or for an early market for pork, nothing is equal to it."

CHAPTER VII.

ANALYSIS AND COMPOSITION OF CORN WHEN CUT IN ITS GREEN STATE.

THE following is taken from J. B. Brown's translation, and is a letter to Mons. A. Goffart from J. A. Barras, Perpetual Secretary of the Central Agricultural Society of France, and editor of "*Journal de l'Agriculture*."

"You do not seek to produce a fermentation." (Earlier in the experiments it was thought that fodder could only be preserved in a green state by fermentation. This is found to be a mistake: all fermentation is but the beginning of decomposition and decay, and should be avoided as much as possible. — J. M. B.) "You propose to maintain all its parts in a condition as near as possible like that of the plant at the moment it was cut.

"It is important to ascertain what is the distribution of mineral and organic matter in the different parts of the stalk of corn.

"When it is cut for the Silo it becomes a mixture of all parts of the plant in such a manner as to give to the stock those which are richest in nourishment as well as those that are the poorest.

"This is one of the advantages of the method. If you give the corn-plant to the stock in the natural state, they will eat first the tender parts, and will leave the hard parts which offer the most resistance to the teeth and have the least flavor.

"I have taken thirteen stalks of corn weighing altogether 37 pounds." (In reducing the weights and measures of the metric system to pounds, feet, and inches, I omit small fractions, getting it near enough for all practical purposes. — J. M. B.), "and have cut them up into six lots as follows. Each of these lots has been dried at 100 degrees (R.). The stalks were cut into three parts. The length of each portion was: upper

part, 25.50 inches ; middle part, 34.60 inches ; lower part, 31.50 inches. Average total length of each stalk without tassels being a fraction over nine feet.

Table No. 1.

	WEIGHT IN GREEN STATE.	WEIGHT AFTER DRYING.	WATER, OR LOSS PER CENT.
	Grammes.	Grammes.	
Leaves	4.805	1.315	72.63
Tassel . . . . .	.102	.047	56.07
Ear, with stem	3.026	.752	75.14
Upper part of stalk	1.270	.125	90.15
Middle part of stalk	2.446	.341	86.06
Lower part of stalk	5.146	.661	87.15
13 stalks	16.795	3.241	80.76

"Thus the water was quite unequally distributed in the stalk. They were more watery at the upper part, but the flowering portion was much less ; the grain was still milky.

"The relations between the different parts of the plant are found to be as follows :—

Table No. 2.

	GREEN STATE.		DRY STATE.	
	Per cent of Weight.		Per cent of Weight.	
Leaves	29.20	47.87	40.57	65.19
Tassel	66		1.42	
Ear, with stem	18.01		23.20	
Upper part of stalk	7.56	52.13	3.85	34.81
Middle part of stalk	14.86		10.52	
Lower part of stalk	30.01		20.44	
	100.00	100.00	100.00	100.00

"This shows that the stalks when green surpass in weight the remainder of the organs of the plant. They contain, however, a less proportion of dry matter, and less even than the leaves which have in the fresh state a much less weight.

"I have analyzed separately each of the six lots ; and I have obtained the following composition in organic substance, and ashes or mineral substance : —

Table No. 3.

	STALK.						
	LEAVES.	TASSEL.	EARS.	UPPER.	MIDDLE.	LOWER.	ENTIRE PLANT.
Organic substance	86.01	94.80	98.30	95.43	97.31	98.26	94.26
Ashes or mineral substance . .	10.99	5.20	1.70	4.57	2.69	1.74	5.74
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

"Thus it will be seen that the mineral substance is accumulated in the leaves and upper part of the stalk.

"Here are the exact proportions of the mineral substance in the different organs of corn : —

Table No. 4.

Leaves	77.70
Tassel	1.22
Ear and stem	6.79
Upper part of stalk	3.13
Middle part of stalk	4.87
Lower part of stalk	6.29
	100.00

"Thus, more than 77 per cent of mineral substance is accumulated in the leaves, more than 14 per cent in the stalk, and only about six per cent in the ear.

"We will now ascertain the composition of the different parts of the plants, as appears when dried : —

Table No. 5.

	STALK.						
	LEAVES.	TASSELS.	EARS.	UPPER.	MIDDLE.	LOWER.	ENTIRE PLANT.
Nitrogenous substances . . .	6.28	6.27	11.09	4.34	3.86	3.37	6.47
Fatty matter soluble in ether .	1.30	1.90	2.50	1.00	.40	.30	1.28
Saccharine matter soluble in alcohol	6.50	4.70	8.30	17.50	20.60	21.00	11.77
Starch	64.33	25.23	73.51	39.49	38.65	35.79	56.35
Cellulose	10.60	56.70	2.90	33.10	33.80	38.00	18.37
Mineral substance	10.99	5.20	1.70	4.57	2.69	1.74	5.74
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Nitrogenous per cent	1.004	1.004	1.775	.694	.617	.540	1.033

"The ear is found, as we would expect, much richer in nitrogenous substance than the other parts of the plant. The nutritive power (or comparative value) as it is agreed to define it, by the relation of the azotic substance to the sum of the fatty matter, sugar, and starch, is quite inferior in the stalks to that of the other organs, as the following table shows.

"Taking the ear as unity, the proportionate nutritive power is as follows:—

Table No. 6.

		NUTRITIVE VALUE OF THE WHOLE PLANT.
Leaves . . . . .	.66	2.54
Tassel	1.49	.09
Ears	1.00	2.57
Upper part of stalk . . . . .	.57	.17
Middle part of stalk . . . . .	.49	.41
Lower part of stalk . . . . .	.45	.69
		6.47

"The stalk, however, shows that it is very rich, and, above all, the leaves, which therefore should be taken care of for the cattle. The fatty matter is concentrated in the leaves and in the ear, the saccharine matter in the leaves and stalk, and mostly in the lower part of the stalk.

"The following table indicates the concentration of saccharine matter in the leaves and stalk : —

Table No. 7.

	EACH PART CONTRIBUTES.	PER CENT OF DIFFERENT PARTS TO THE WHOLE.
Leaves	2.64	22.36
Tassel . . . . .	.07	.59
Ears	1.93	16.41
Upper part of stalk . . . . .	.67	5.69
Middle part of stalk	2.17	18.45
Lower part of stalk	4.29	36.50
	11.77	100.00

"Cellulose substance is, as we would expect, in large proportion in the stalk, and mostly toward the lower part of it. It is principally in the leaves and ears with stem, that the starch and the other principles which are neither cellulose nor nitrogenous nor mineral are found : —

Table No. 8.

	Entire Plant.	Leaves.	Tassels.	Ears.	Upper part of Stalk.	Middle part of Stalk.	Lower part of Stalk.
Phosphoric acid	7.17	3.97	10.01	33.50	9.07	14.02	7.17
Sulphuric acid	3.81	3.21	6.13	3.58	5.61	8.65	3.81
Chlorine	1.35	1.04	2.73	3.52	2.15	Trace.	1.35
Potash	4.41	1.23	7.88	27.11	14.61	2.41	4.41
Soda	8.26	6.78	10.37	21.36	12.57	8.39	8.26
Lime	12.96	13.78	11.87	3.46	10.29	14.31	12.96
Magnesia	6.60	5.64	15.03	7.04	10.52	8.73	6.60
Iron	0.51	0.46	0.11	Trace.	2.08	0.63	0.51
Silex	54.75	63.76	35.83	0.34	29.83	41.37	54.75
Carbonic acid and waste	0.18	0.13	0.03	0.09	3.27	1.49	0.18
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

"The above table shows that the ears are the richest in phosphoric acid and potash. These also contain the largest percentage of soda, the least of lime and silex.

"As to the distribution of each mineral element in the different parts of the plant, it is necessary, in order to study it thoroughly, to enter into a more detailed and separate examination. Phosphoric acid or phosphorus plays an important part in agriculture, not because it is more indispensable to vegetation than several other elements, but because nature has not distributed it with so much profusion in all lands or in the atmosphere as certain other elements that on that account are considered secondary. Indeed, there is not any one element in vegetation of any greater importance than another; and, if any person judges otherwise, it is because he places himself at the point of view of an agriculturist who, having need to produce certain crops of a special kind, needs to accumulate such elements as enter specially into their organization.

"Therefore, in order to obtain abundant food, in order to produce with rapidity domestic animals whose organs require much phosphorus, it is necessary to seek methods for increasing the supply of phosphates, more or less assimilable, that the plants may find in the bed where their roots develop.

"To indicate the sources of the supply, whether in the residuum of factories, or of the household, or in the numerous repositories, has been one of the greatest services rendered in modern times to agriculture by chemistry and geology.

"But there our knowledge ends: we are entirely ignorant as to how the phosphorus distributes itself in the vegetable, by what process it penetrates and circulates and accumulates in certain organs, or exactly what these organs are.

"As to the relative distribution of these elements; the following tables show as far as concerns maize fodder intended for green preservation by Ensilage.

PHOSPHORIC ACID.

Table No. 9.

	AMOUNT IN EACH PART.	PRESENT IN DIFFERENT PARTS.
	Grammes.	
Leaves	0.177	42.96
Tassel	0.007	1.70
Ears	0.132	32.04
Upper stalk	0.020	4.85
Middle stalk	0.026	6.31
Lower stalk	0.050	12.14
Whole plant, dry	0.412	100.00

SULPHURIC ACID.

"The rôle of sulphur in vegetation is nearly unknown : all that we know is that it is absolutely necessary. It is generally found in less proportion than phosphorus, in corn as 88 to 180.

Table No. 10.

	QUANTITY IN EACH PART.	PER CENT IN EACH PART.
	Grammes.	
Leaves . . . . .	.144	65.75
Tassel	0.005	2.28
Ears	0.014	6.39
Upper part of stalk	0.009	4.11
Middle part of stalk	0.016	7.30
Lower part of stalk	0.031	14.17
Whole plant, dry	0.219	100.00

CHLORINE.

"By the conclusive experiments of Prince de Salon-Horstman we know that chlorine is indispensable to the regular operations of the different phases of vegetation ; but the most complete obscurity rests upon its real action.

Table No. 11.

	QUANTITY IN EACH PART.	PER CENT IN DIFFERENT PARTS.
	Grammes.	
Leaves	0.047	60.26
Tassel	0.002	2.56
Ears	0.014	17.95
Upper stalk	0.009	11.54
Middle stalk	0.006	7.69
Lower stalk	Traces.	Traces.
Whole plant, dry	0.078	100.00

POTASH.

"Berthier's saying, 'No plant without potash,' has become a maxim.

Table No. 12.

	QUANTITY IN EACH PART.	PER CENT IN EACH PART.
	Grammes.	
Leaves	00.55	21.94
Tassel	0.006	2.27
Ears	0.107	42.29
Upper part stalk	0.036	14.23
Middle part stalk	0.041	16.20
Lower part stalk	0.008	3.17
Whole plant, dry	0.253	100.00

SODA IN CORN.

"In the whole plant 0.475 grammes, of which two-thirds accumulated in the corn and one-sixth in the ears.

LIME IN CORN.

"Lime has been considered necessary to plant-growth from a very ancient period: more than four-fifths are found in the leaves, only two per cent in the ear, and the quantity increases in descending the stalk.

MAGNESIA IN CORN.

"The role of magnesia in vegetation has been but little studied. There is no doubt, however, after the experiments made in Germany, that its presence is indispensable to plants. Two-thirds of it is found in the leaves, and the remainder equally divided in the other five parts of the plant.

IRON IN MAIZE.

"Iron is evidently of great importance to the life of animals who are nourished by vegetation. As with sulphur, chlorine, soda, lime, and magnesia, the greatest accumulation is in the leaves. But it is a noticeable fact that it is absent from the ear, which would seem to explain the opinion of physicians as to the insufficiency of corn-meal for exclusive human food.

"As to corn harvested green in order to be fed to cattle after Ensilage, the lack of it in the ear is equalized by its presence in other parts of the plant.

SILICA.

"It is probable that all silica enters the organs of vegetation in the soluble state. The quantity found is very considerable.

Table No. 13.

	QUANTITY IN EACH PART.	PER CENT IN DIFFERENT PARTS.
	Grammes.	
Leaves	2.843	90.45
Tassel	0.026	0.82
Ears	0.001	0.03
Upper part of stalk	0.042	1.33
Middle part of stalk	0.084	2.67
Lower part of stalk	0.147	4.70
Whole plant, dry	3.143	100.00

"Thus the stalk contains only about one-tenth part of the amount in the leaves, which contain 90 per cent of the whole plant."

Thus it is seen by the Table No. 1, that the ear with cob and stem forms but about one-fifth of the whole plant either in its green or its dry state. By Table No. 2, that the leaves contain of solid material over 40 per cent of the whole plant. By Table No. 4, that of the mineral constituents the leaves contain over three-fourths of all the mineral element in the whole plant.

But referring to Table No. 6 we find that when none of the valuable attributes of the plant are lost, the value of the ear as compared to the leaves is as 2.57 to 2.54; and, as compared to the whole plant, as 2.57 to 6.47. This shows the stock, leaves, and tassel to be worth nearly three times as much as the ear, taken when the ear is in the milk. Experiments made last season in the West showed that hogs fattened faster upon green corn (probably past the milky stage) than when fed upon old corn.

Table No. 7 shows that the ear and cob contain less than one-sixth as much sugar as the whole plant, and but little more than two-thirds as much as the leaves, and little more than one-fourth as much as the stalk.

While the ears are richer in proportion to their weight in phosphoric acid, — the most expensive mineral which we require to restore to our long-cropped fields, especially where dairying has been pursued, — still Table No. 9 shows that the leaves altogether contain one-fourth more than the ear, and that the ear contains but 32 per cent of that contained in the whole plant. Tables 10 and 11 show that the ears contain but 6 per cent of the sulphuric acid, and but 18 per cent of the chlorine. And Table 12 is still more instructive; for it shows that the leaves contain more than half as much potash as the ears, that the stalk contains nearly as much as the ear, and that the ear with the cob and stem contain but 42 per cent of the potash contained in the whole plant. Iron — that which gives color not only to the beautiful and luxuriant vegetation, but paints the rose upon the cheek of health, and gives vigor to the animal system, and strength and clearness to the human brain, — is not found in the ears at all.

Of silica we find that over ninety per cent is in the leaves, while but three one-hundredths of one per cent are in the ear.

The lesson I wish to draw from this summary is twofold. First, — it is shown that the ear contains, before the stalk has lost by deterioration through exposure to the weather, but a small part of the valuable constituents of the whole plant.

The following table, carefully compiled from the foregoing, gives the comparative value which the ear bears to the balance of the plant.

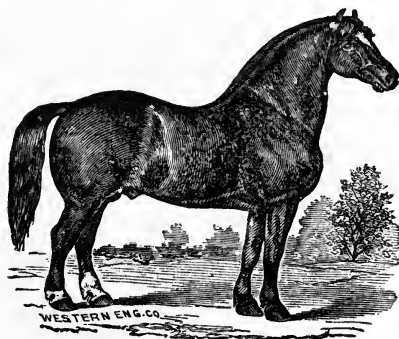
Nutritive Value of the Ear, compared to the Rest of the Plant.

	IN THE EAR.	IN BALANCE OF THE PLANT.	TOTAL.
Solid matter	23.20	76.80	100
Sugar	16.41	83.59	100
Mineral substances	6.79	93.21	100
Phosphoric acid	32.04	67.96	100
Sulphuric acid	6.39	93.61	100
Chlorine	17.95	82.05	100
Potash	42.29	57.71	100
Soda	16.66	83.34	100
Lime	2.00	98.00	100
Magnesia	6.67	93.33	100
Iron	Trace.	100.00	100
Silica	0.03	99.97	100

Now, all of these mineral constituents are necessary for the health and well-being of our domestic animals; and when corn is cured by Ensilage they are all present in solution, so that when introduced into the alimentary canal such parts and proportions as the animal economy requires can be readily taken up and assimilated. Now comes an almost equally important fact; and it is this, — a very large proportion of these mineral constituents of the plant passes through the animals, and is found in their excrements.

When corn is preserved by Ensilage, all of these valuable mineral elements are in condition, when applied in the manure to the next crop, to be immediately taken up and assimilated by the growing plants. What an immense saving is here! When corn-fodder is cured by desiccation, many of the leaves, that part of the plant which is richest in mineral matter, are lost, being blown by the winds into the fence-corners, and other out-of-the-way places where their mineral wealth is wasted. The stalks are not eaten and digested by the

animals, are a nuisance in the manure-pile, and are at least two years in becoming sufficiently decomposed in the field, so that their mineral fertilizing material is in condition for the growing plant to avail itself of.



CHAPTER VIII.

EXPLANATIONS WHY ENSILAGE MUST KEEP.

MANY farmers and others came to see the process of filling the Silo with the green corn-fodder; nearly all declared that it would spoil, mould, heat, and rot. Several said, "I guess you will have a fine lot of manure before winter." I replied, "Gentlemen, it will not spoil at all; it will not even heat: it will come out just as good feeding stuff as it is now, and I think better."

None of them believed a word I said, it was plain to be seen. They were certain that this last of my "new-fangled notions" would prove a complete failure, and they would have the laugh on me this time. Some endeavored to cheer me up by saying that "even if it did not work well for the purpose I intended, the Silos would be a capital place to store fruit in, so that it won't be *all* loss, any way."

This kind of talk had been going on for several days, and was, I confess, getting to be rather monotonous. One day a number of well-meaning but incredulous neighboring farmers were present. They knew nothing of agricultural chemistry, or the philosophy of its preservation; but I made up my mind I would convince them that the green corn-fodder would *keep* instead of rotting: therefore I said, "You think it will heat and spoil, do

you?" — "Yes, I am afraid it will," said they each and all." — "Now, I tell you it won't do any such thing." "Why won't it? what makes you think so?" they asked. I knew that I might quote M. Goffart, and all the agricultural scientists in the world to them till doomsday, and it would have no impression on their minds, so I took homely illustrations. Said I, "Why doesn't a pile of horse-manure heat when it is left in the stable all winter under the feet of the horses, until it gets three or four feet deep? Why doesn't sheep-manure heat when it is left all winter in the sheep-folds, and becomes a foot and a half to two feet deep?" — "Because it is *trod down* so solid, the air can't get into it." — "Just so! that is the reason this corn-fodder won't heat and spoil: it is 'trod down' so solid that the air cannot get into it," I rejoined. This was rather a staggerer. "Is there any thing which is quicker to heat when it has a chance than horse or sheep manure?" I asked. "No-o-o," they reluctantly admitted. "Now see here," said I: "haven't you all noticed in the spring, when you were getting out your hog-manure, that you often came across, in the bottom of the yards, buried under the manure, potato-vines and weeds which had been thrown in to the hogs the fall before, that were just as green and fresh as when they were first pulled out of the ground?"* They all replied, "Yes, we have."

BILLERICA, April 21, 1880.

* MY GOOD DOCTOR, —According to request I send you an account of the finding of a fresh and perfectly preserved lily-pad, six or seven feet below the surface of one of our Concord-river meadows. It was in perfect shape, and as green and healthy-looking as in its prime of life. Having a love for geological researches, and thinking these meadows had some time been deposited by the river, I concluded to make an examination. At the top I found a foot in depth of black meadow soil; then, next below, another foot in depth of diatomaceous deposit of microscopic shells, composed entirely of pure silex, so small that they make a good silver-polish. I then came to a pure vegetable deposit, consisting of sticks and leaves, four feet deep. At the bottom of this I found green and well-preserved lily-pads, clam-shells, char-

"Well," said I, "my Ensilage will keep just the same way. I trample it down solid as it is put in the Silos, cover it with rye-straw, then floor it over with plank, and put about a foot in depth of cobble-stones or boulders which will press it down solid as a cider-cheese. No air can then get in. The air and gases already in will be continually being forced out by the weight. Therefore it cannot heat any more than the horse and sheep manure can when it is trodden down compactly." They were silenced.

Pretty soon one old farmer who has got a great deal of good, hard, sound sense in his head, slowly looked round, and still more deliberately said, "By Horn, I've changed my mind! I believe it will keep. But you will have to feed it all out before the weather begins to get warm in the spring, won't you?" — "No," I replied: "the outside temperature has nothing to do with its keeping. Won't a pile of horse or sheep manure 'heat' and 'burn' if it lies up loose so that the air can get at it in the winter, be it ever so cold, just as badly as in the hottest days of summer?"

"Well, there ain't much difference," said he. "Now, it is just the same with Ensilage," I replied. "If it does not 'heat' in the winter, it will not in the summer. It is the presence of air, or rather of the oxygen in the air, which causes manure or any damp mass of organic matter to ferment or decay." — "Well," said he, as he started for his team, "as I said afore, I believe it will come out all right." The rest of them said nothing; and whether all of them have found out to this time that it does keep,

coal, and sticks with marks of beaver-teeth, all in a fine state of preservation. These deposits must have been preserved here, perfectly excluded from light and air, for at least a thousand years.

Very respectfully,

DANIEL PARKER, M.D.

or not, I am unable to say. One thing is certain : they were silenced for once.

Now, my explanation why it keeps, and why it is somewhat sour, is this :—

When it is cut ever so fine, and trodden down ever so vigorously, still there is some air left in the little spaces between the pieces of the stalks ; and the dried leaves, if there are any, are full of air which has taken the place of the sap which has evaporated. Large stalks, after being cut four-tenths of an inch long, are finer than small ones ; which is one reason among several why the corn which grows the largest is the best for Ensilage. The oxygen in this amount of air—be it greater or smaller—immediately starts a fermentation. Fermentation, mould, decay, rot, and fire are all identical. The only difference is in the degree of speed with which the combustion goes on. They all alike depend upon the presence of oxygen, and cease when this active agent of destruction is removed. The process of combustion, whether slow or rapid, consumes oxygen, and gives out carbonic acid gas.

This fermentation consumes the small amount of oxygen which is contained in the mass of Ensilage, and liberates an amount of carbonic acid gas which takes the place of the oxygen. The fermentation in its incipient stage is arrested for want of oxygen. None can get in from the top ; for the compression which is constantly going on is all the time forcing the gases out, and where there is ever so slight a flow *out*, none can possibly flow in. Then, as the carbonic acid gas is heavier than the atmosphere, the sides and bottom of the Silo being tight, and as the carbonic acid gas cannot leak out, the air cannot get down into the space occupied by the carbonic acid gas, any more than air can get down into a jug filled

with water or other heavy liquid until the water or other liquid is poured or leaks out. *The Ensilage is thus immersed in a bath of carbonic acid gas.* Fermentation under such circumstances is an impossibility.

CHAPTER IX.

ENSILAGE ADAPTED TO WARM AS WELL AS COLD CLIMATES.

RIGHT here let me reply to an opinion which I saw expressed in a Southern paper which was commenting upon the success which had attended the "Winning-Farm" Ensilage experiment: "We understand Dr. Bailey intends to try the experiment at 'Virginia Stock Farm.' We shall await the result of his trial with a great deal of interest, and hope he will succeed equally well; but we fear that while this system of preserving green forage-crops will doubtless prove of incalculable benefit to the North, we do not think it will answer in as warm a climate as Virginia."

If any of my fellow farmers in Virginia or other Southern States have the same fear, let me call their attention to the fact that the climate of that part of France where M. Goffart has been so successful in preserving fodder by Ensilage is nearly if not quite as warm as Virginia, Kentucky, Tennessee, or Missouri; and also to the reasons given in the preceding chapter. I believe the system is equally applicable wherever the winter's cold or the droughts of summer necessitate the preservation of forage for the food of domestic animals.

The sourness or acidity which is, I believe, always present in a greater or less degree, especially if the

corn is allowed to stand in the field until the ear is fully formed, is far from being an injury: on the contrary, it is probably an advantage. Nearly if not all of our domestic animals gain faster when their food is allowed to stand and ferment until more or less sour before feeding.

This has been demonstrated at the Massachusetts Agricultural College. There all food is chopped and steamed. By actual experiments it was noticed that the animal gained faster, and had a better appetite, when the steamed food was allowed to stand twenty-four hours, at least, to ferment until there was a perceptible degree of sourness, than when fed upon the same food before any such change had taken place.

In regard to swine, every farmer knows that they gain faster upon *sour*, not putrid food, than upon sweet.

The other day a neighbor of mine, a most excellent farmer, called to see Ensilage. He winters about 60 head of cattle. He informed me that several years ago he began to cut his hay and other fodder, and mix his grain with the cut fodder, wetting it thoroughly with boiling water. He found a very considerable gain in so doing. About three years ago he began to mix and wet with boiling water a day's feed for his stock, and let it stand twenty-four hours before feeding, during which time it ferments and becomes quite sour. He informed me that his stock ate it better for the fermentation, and that there is a saving of at least 50 per cent in the amount of hay they required, from the amount they required if fed dry and uncut. His process, doubtless, has somewhat the same effect in facilitating the digestion and assimilation of the starch and other nutritive elements in the fodder as is produced by Ensilaging.

Among the many minor advantages to be gained by

adopting the system of Ensilage is the lessening of the danger from fire. The tramp with his pipe, or the incendiary with his match, would have hard work to raise much of a blaze in a Silo with nothing but Ensilage for fuel.

Another is, the crop can be all planted at one time. Large lands can be ploughed and harrowed, long rows planted admitting the use of agricultural implements to greater advantage, and much less time consumed in turning corners. The work can be not only accomplished in less time, but easier and better.

The dairyman and stock-raiser can systemize their work. They will have all winter to get out their manure, which they can spread broadcast upon the winter rye. They will have no spring's work except to "slick up," repair fences, &c., see to the kitchen and fruit garden. They can now find time to trim their orchards, to graft over trees which bear undesirable fruit, and to put out that "little patch of strawberries," which they have been promising the good wife so long, but which they never before, in the hurry of their spring's work, could get time to attend to.

Then, when all the little jobs that ought to be attended to in the spring are done up, the potatoes planted, and the pleasant days of May have come, the broad fields of waving rye are beginning to show their shining heads, and the time for work is here.

If the farmer I am writing about now, is a worker, and economical, — and he is both, — he has been changing work with his neighbors, helping them get *their* spring's work done; and now they come with their cradles, and in three days the 20 acres of rye are all safely housed. Or, if he has a reaper, — which he has not, — it can be done in one day. No waiting for fair weather: a cloudy day

is just as good as any; even if it rains a little, no need for the work to stop. 'Tis but the work of a couple of hours to replace the plank covering, throw on the bowlders, and the rye Ensilage is saved.

Now comes ploughing-in, the rye stubble. Three or four teams make quick work of the 20-acre field. I use the Cassidy sulky plough. It saves not only the labor of holding the plough, but does the work better. Land so hard that it cannot be ploughed with a common plough is turned over without difficulty. It is much easier for the team. You can turn corners quicker, and plough closer to fences. At "Virginia Stock Farm" we averaged with each pair of horses 20 acres per week. For ploughing under weeds or green crops, nothing is equal to it. It is smoothed and fined in one day by a boy and a pair of horses with the Thomas smoothing-harrow. In four days the farmer himself can plant it in drills $3\frac{1}{2}$ feet apart, using one bushel of seed to the acre, with one horse and an Albany planter. Or if he has a Farmer's Favorite grain-drill, with a pair of horses, he can plant it in less than two days, at the same time distributing a little fertilizer in the drill. (This will *pay*, no matter how rich your land is.)

Every farmer ought to have a Farmer's Favorite grain-drill, if he raises 20 acres of Ensilage.

With it he can drill in his rye after his corn is cut, which is better than broadcasting, can save ten bushels of seed, and will have a better crop.

It has two sets of "feed-cups," which make it the best combined grain-drill and corn-planter in the world.

If he thinks he cannot afford the Farmer's Favorite grain-drill, he *must* have an Albany seed-sower and corn-planter.

After his corn is planted, he has nothing to do but

look after his stock, attend to the garden, and live the life an American farmer ought to live. A boy and a pair of horses with the Thomas smoothing-harrow one day in a week will keep the corn free from weeds, the soil completely pulverized, inducing absorption and preventing evaporation, until the corn is a foot high. Then, when it is about waist high, he will want one of Timothy B. Hussey's Centennial improved horse-hoes. With it he can hoe five to seven acres a day better than it can possibly be done by hand, killing and burying up every weed, and throwing just earth enough around the stalks to strengthen them and prevent the wind from breaking them over. Corn is growing very rapidly now, and is very tender, and I think is better for a little hilling. By the way, let me say here that I have a quantity of seed-corn expressly raised for me for Ensilage. I tested it last year on a small scale. I had single stalks which before the tassel was in sight weighed nine pounds; others when fully grown with the grain in the milk weighed over 15 pounds each. I can safely guarantee this corn if planted upon good corn land, in good condition well manured, with proper cultivation to produce from 40 to 75 tons to the acre of green fodder *just right for Ensilage*. The stalk is extremely sweet and succulent; some of them being over six inches in circumference and 14 feet high, with an immense amount of long, broad leaves, some of which measured four feet ten inches in length, and 6½ inches in width. It will not require more than half a bushel to plant an acre (of other kinds one bushel is needed); so that, although it is somewhat high-priced by the pound or bushel, it does not cost so very much more by the acre. It should be planted in drills four feet apart, with the stalks six to eight inches apart in the rows. Be sure and not get it too thick,

for it throws out a great number of suckers, and to yield a large crop must have room and air. I will send sample bags of this Mammoth Ensilage corn by mail, containing one pound, on receipt of 60 cents; three pounds, \$1.50; by express or freight, half a peck, \$1.25; one peck, \$2.00; half a bushel, \$3.00; one bushel, \$5.00; two bushels or more, \$4.00 per bushel. No charge for bags.

It is a waste of time to plant common sweet corn. None of it is as sweet as this Ensilage corn, nor as nutritious, and it will not yield one-third as much; besides it is much easier to cut up a ton of large stalks than a ton of small ones. It is just as easy to cut with the cutter, easier to feed into the cutter, and, when cut, the disks split into small pieces, so that the Ensilage is as fine as if the stalks were small, and packs closer in the Silo. There is every advantage in growing the Mammoth Ensilage corn.

Now I want to say something about fodder-cutters. We must have a self-feeding machine, which will cut or *shred* (which would be better, as it would pack closer, thereby excluding the air more completely) at least sixty tons per day without any labor on the part of the men tending it, except that required to throw the fodder in armfuls upon the apron of the machine.

I think I have found it in Baldwin's Improved American fodder-cutter. I shall try it this spring when I Ensilage my rye, and, if satisfactory upon trial, will in a second edition (if one is called for) tell you all about it. One thing I will say now: a cutter which has but one feed-roller will *not* answer. There must be two rollers, the top one fluted, the bottom roller smooth, between which the fodder must pass. The top roller must be geared to rise and fall, to adjust itself so that a large or

small amount of fodder will be fed with the same speed and regularity.

Baldwin's fodder-cutter I believe to be the best *cutting* machine for Ensilaging purposes on the market.

I think tearing or shredding the stalks would be much better than cutting. The fodder shredded must pack closer, thereby giving less room for air. I have invented, and am perfecting, a machine which will cut *and* shred fodder of all kinds, with the expenditure of one-half the power all other machines I have seen require to do the same work. I utilize a principle never before made use of in fodder-cutters. I hope to have it completed, and be able to furnish it in season for the Ensilaging of the corn. To successfully preserve green fodder, three things are essential: first, that the fodder shall be in as fine a condition as possible so as to compact; second, that the Silos shall be air and water tight on the sides and bottom; third, that sufficient weight shall be placed upon it in order to press out all or nearly all of the air. If the air can be all forced out, there will be *no* fermentation, and the Ensilage will keep indefinitely in the same condition as when put into the Silo. In that case, in order to receive the full benefit of the system of Ensilage, it will be necessary to pile up the Ensilage upon the stable floor twelve to twenty-four hours, until active fermentation takes place, before feeding, that the benefits of fermentation may be secured as explained in the following chapter.

CHAPTER X.

A NEW DISCOVERY.

DURING my investigations and experiments it occurred to me that it would be a great improvement to mix the concentrated nitrogenous grain, such as the refuse from flour-mills, wheat, rye, or buckwheat bran, shorts or middlings, the refuse grains and feeding-stuff from breweries, or prepared animal food from fish and meat scraps, such as Bowker's animal meal, fish-scrap prepared by Goodale's process or otherwise, with the green corn-stalks or other forage crops *at the time of Ensilaging*.

For while the Ensilaging of green corn, rye, and other succulent forage-crops is an immense advance over the old system of curing forage-crops by desiccation, and while such *Ensilage* is a most excellent and succulent food for all domestic animals, still it is by no means a perfect food, being deficient in albuminoids: therefore it is necessary to add to the ration of Ensilage a certain amount of concentrated nitrogenous food in the form of grain, or animal-scrap-meal, or other concentrated cattle foods containing albuminoids to excess.

Animals fed exclusively upon Ensilaged corn will become fat, dull, heavy, and lymphatic, the nervous and muscular systems not receiving that degree of nutrition which they require for their full development.

Starch, the chief nutritive element in corn and other carbonaceous plants, is almost identical in its chemical constituents with sugar. But it is difficult to digest by reason of the toughness of the envelope which encloses the starch-cell.

The gastric juice of the stomach being able to dissolve but a part of them, the remainder passes from the animal in its excrement, and is lost.

The softening and fermentive process through which the Ensilage passes in the Silo bursts the starch-cells, and converts the starch into sugar, as is evinced by the strong odor of alcohol which is emitted when the Ensilage is exposed to the action of the oxygen in the atmosphere. The digestion of the Ensilage is thus rendered easier, and its assimilation more perfect.

By mixing the concentrated nitrogenous food with the comminuted forage at the time of Ensilaging, the labor of feeding the concentrated nitrogenous food is reduced to a minimum.

The nitrogenous food is also subjected to the same softening and fermentive process. The carbo-hydrates in it (composed largely of starch) are liberated, and fitted for easy digestion and assimilation. The albuminoids (which contain the nitrogen) are also rendered more digestible and assimilable by this process of maceration and fermentation, which has the same effect substantially upon them as that which is produced by the process of steaming or cooking.

The concentrated food should be added in such amounts that the mixture shall contain the proper comparative amounts of albuminoids and carbo-hydrates which are best adapted to the sustenance and growth of our domestic animals. An addition of about ten per cent of wheat-bran to the corn-fodder would make the

mixture about equal to the best clover hay, and would be admirably adapted for milch-cows, young and growing cattle, and colts. It is also excellent for breeding-ewes, and for swine nothing could be better.

The great importance of this *new discovery*, both in the saving of labor and increasing the nutritive value of the concentrated food over that which it has when fed in a dry and raw state, and the fear that some avaricious person might take out letters-patent upon the process, and seek to prevent the full benefits of this great and *improved* system of Ensilage from being adopted, by exorbitant claims for royalty, has induced me to make application for a patent upon the process of mixing concentrated nitrogenous cattle-foods with the comminuted green corn, rye, or other succulent forage *at the time of Ensilaging the same*, in such proportions as shall give to the mixture the proper amounts of albuminoids and carbo-hydrates which are best adapted to the growth and subsistence of our domestic animals. Besides the labor saved in feeding (at least \$1.50 for each ton of grain), and the increased value by facilitating digestion (fully ten per cent), is the certainty that each animal will get its ration, and no more. No heedless stable-boy will empty two measures of grain into one cow's manger, and give none to the next, thereby depriving one of the necessary food, and impairing the digestion of the other by an overfeed.

CHAPTER XI.

FOOD INGREDIENTS. — CHEMICAL TERMS EXPLAINED.

WATER. — If a piece of wood or wisp of hay be dried some time in a hot oven, more or less water will be driven off. The water in feeding-stuffs varies from 80 to 90 pounds in every 100 pounds of young grass or fodder-corn, to only 8 or 10 pounds to the 100 in dry straw or hay.

ORGANIC SUBSTANCE. — If the dried wood or hay be burned, most of it will pass off as gas, vapor, or smoke. The part thus burned away is the organic substance. The residue : —

THE ASH contains the mineral matters, that is, the potash, lime, phosphoric acid, &c., of the plant. The most important part for our present purpose is the organic, the combustible matter. This consists of three kinds of ingredients, albuminoids, carbo-hydrates, and fats. The main point in economical feeding is to secure the right proportions of these at the lowest cost.

ALBUMINOIDS — also called protein compounds, proteids, and flesh-formers — contain carbon, oxygen, hydrogen and nitrogen. Thus they differ from the carbo-hydrates and fats, which contain no nitrogen. The name albuminoids comes from albumen, which we know very well as the whites of eggs, and it is found in milk. The fibrin of bone and muscle (lean meat) and the casein (curd) of milk are also albuminoids. Indeed, the solid part of blood, nerves, lean meat, gristle, skin, &c., consist chiefly of albuminoids. In plants they are equally important ; plant albumen occurs in nearly all vegetable juices, especially in potatoes and wheat, casein or legumin in beans and peas, and fibrin in the gluten of wheat, the basis of what farmer-boys call "wheat gum." Clover, bran, beans, peas, oil-cake, and flesh and meat-scrap are rich in albuminoids.

CARBO-HYDRATES consist of carbon and hydrogen. The most important are starch, sugar, and cellulose (woody fibre). They make up a

larger part of the solids of plants, but only a little of them is stored in the animal body. Potatoes, wheat, poor hay, straw, and cornstalks consist largely of carbo-hydrates.

FATS have more carbon than carbo-hydrates, and like them have no nitrogen. Fat meat, tallow, lard, fish-oil, the fat (butter) of milk, and linseed oil are familiar examples of fats. Indian corn, oil-cake, cottonseed and linseed, are rich in fatty matters." [The last three are also rich in albuminoids.] — *From American Agriculturist, January, 1879.*

CHAPTER XII.

CAPACITY OF SILOS.

A CUBIC foot of Ensilage weighs from 40 to 50 pounds; a daily ration for a cow is 50 to 60 pounds: therefore it is only necessary to allow one-and-one-half cubic feet for each cow daily, to tell how large a Silo is wanted. First let the stock-raiser or dairyman decide how many head of stock he wants to keep: the number he *has* kept will be no criterion.

“Winning Farm” three years ago could keep but six head of cows and one horse: now 35 cattle, 5 horses, and 125 sheep are kept, and there is every probability of doubling the number next season. One cubic foot will keep a sheep a week in good condition. According to the rule laid down above, it will require $547\frac{1}{2}$ cubic feet of Ensilage to keep one cow one year. To keep two cows, a Silo is required ten feet wide, ten feet long, and ten feet deep. This would hold about twenty-five tons, and could be grown upon one-half acre of rich, warm land. For four cows it should be built twice as long. It will only be necessary to have your Silos contain 550 cubic feet for each cow's subsistence for twelve months. If the cows are pastured six months of the year, then 275 cubic feet of Ensilage will be sufficient for each cow. It is very important that the sides should be perpendicular, and smoothly plastered with a cement-plaster, so that the Ensilage will settle evenly, and in

order that the plank covering may have nothing to catch upon as it settles under the heavy weights placed upon it.

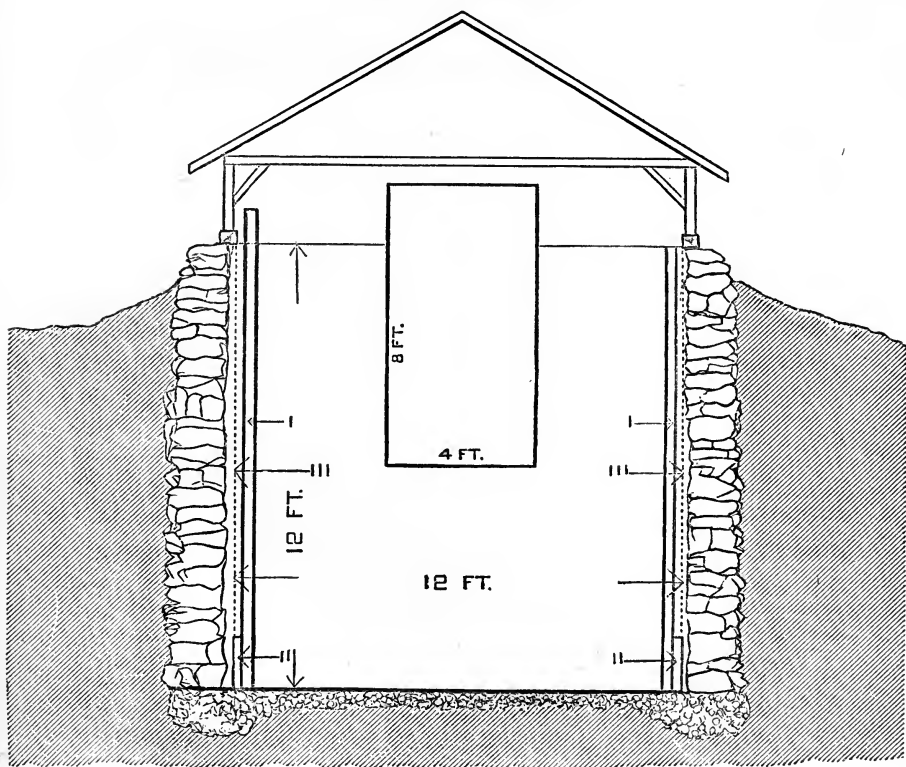
Small Silos, capable of holding enough Ensilage for ten to twenty cows, can be constructed by digging and walling up, as for a cellar, when stone is plenty. Mix one part cement with two parts sand, and make a concrete floor about one inch thick. Put a cheap battened roof over it to keep the rain and snow out, and you have just as good a Silo as any. One 12 feet wide, 30 feet long, and 12 feet deep, would not cost, besides the labor, over fifty dollars, and would hold enough Ensilage to winter 12 to 15 cows, or about 175,000 pounds, or 87½ tons. (See cut on opposite page.) This can easily be produced upon two acres of suitable land properly prepared.

Two feet in depth daily is fast enough to fill the Silo. This rate is better than to fill faster; as the Ensilage will settle better, and there will be less space lost by settling at the top of the Silos. If an accident to cutter or power, or if any untoward incident, stops the filling of the Silo for one, two, or even three days when it is partly full, no injury will be done to the Ensilage, providing one or two men (according to size of Silo) are kept constantly trampling upon it, so as to keep the Ensilage compact. If it begins to dry or heat on top, take a garden watering-pot and sprinkle over it to supply the loss from evaporation.

Two small Silos are better than one large one of the capacity of both; for, with two, one will be empty in the summer, ready to receive rye, clover, or other green forage, which it will be as advantageous to preserve by Ensilage as it is the green corn in the fall.

After the Ensilage is compacted so that it ceases to settle, it is ready to feed out. This takes about a

month. At any time after it is compacted, the weights can be removed, the plank taken up, the straw raked off, and more green fodder of any kind put on top of that which is in the Silo, thereby utilizing all the space. If more fodder be raised than the Silo will hold, the walls can be carried up about two feet with plank, and filled so that when settled the Ensilage will fill the Silo to the top of the masonry walls.



Sectional view of Silo, 12 feet wide, 12 feet high, and 24 or 30 feet long; capacity, 80 to 100 tons of Ensilage, sufficient to winter fifteen to twenty cows; cost, exclusive of labor, about \$40, where stone are plenty.

I, I, three-inch by four-inch scantling.

II, II, 1½-inch by 12-inch plank, between which and the rough wall a concrete or grout is poured.

III, III, dotted line showing the face of the concrete pointing and plastering.

CHAPTER XIII.

ENSILAGE IN THE GREAT DAIRY DISTRICTS.

THE system of Ensilage is especially adapted to the great dairy districts of the West. *Improved* Ensilage will enable the dairyman to make as good an article of butter in the winter as in summer. By it the number of cows can be tripled. It is cheaper to soil cows during the summer than to pasture them where land is valuable, particularly in the vicinity of cities. Fifty cents per week is the average price paid in my section for pasturing a cow; for less than this, a cow can be kept upon Ensilage, and in better condition than the average pasture will keep her: besides, by this system, all the manure can be saved, which will abundantly pay for all the extra labor of caring for the stock, if the labor is greater than in pasturing, which I much doubt.

The system of Ensilage — which I hope to see rapidly adopted (of the hundreds of farmers who have visited "*Winning Farm*," nearly all have assured me that they shall build Silos this season) — will cause our exports of beef and mutton to be immensely increased, while the exports of dairy products will be doubled and tripled.

They are *now* rapidly increasing, as is shown by the following table of receipts and exports of butter alone, at New York, for the years 1874 to 1879: —

	RECEIPTS.	EXPORTS.
	Packages.	Pounds.
1874	994,430	4,695,111
1875	1,080,899	4,216,548
1876	1,292,577	10,045,434
1877	1,269,759	19,686,447
1878	1,277,863	23,029,732
1879	1,581,825	36,153,444

The exports of cheese are fully as important, and of so fine a quality that the English and European dairy farmers are in despair as to the future.

By Ensilage, wool can be produced so cheaply and in such quantities as to preclude the possibility of importation.

Ensilage being so rich in carbo-hydrates, it is especially adapted to the growth of wool. If, in connection with Ensilage, we would feed the cotton-seed raised in the South (no better food can be imagined than Ensilage and cotton-seed meal), we could not only stop the importation of wool, but have wool as well as choice mutton in almost unlimited quantities to export (see chapter on sheep for weights of lambs): their mothers being fed upon Ensilage, numberless flocks could be kept. The old pastures, which have become so worthless by being stocked with cows so long, would, if pastured with sheep, speedily improve, and soon be restored to their original fertility.

In the rich and fertile West, Ensilage of corn can be raised and stored in Silos for one dollar per ton: as two tons are equal to one ton of the best hay, this places the comparative value of hay at two dollars per ton; this is less than hay can be cured for. Two acres of *good* meadow are required to keep one cow; while by the system of Ensilage — improved by my process — *eight* cows may be kept in high condition upon the same land.

No country is so well adapted by reason of both soil and climate as our own for the growth of the corn-plant. Now that we know how to utilize this greatest gift of Nature, and save all its valuable constituents instead of a part only, who is able to correctly estimate the blessings which will follow when this knowledge is universally diffused and profited by?

THE CORN-SONG.

BY JOHN G. WHITTIER.

HEAP high the farmer's wintry hoard ! heap high the golden corn !
No richer gift has Autumn poured from out her lavish horn.
Let other lands exulting glean the apple from the pine,
The orange from its glossy green, the cluster from the vine.
We better love the hardy gift our rugged vales bestow,
To cheer us when the storm shall drift our harvest-fields with snow.
Through vales of grass and meads of flowers, our ploughs their furrows made,
While on the hills the sun and showers of changeful April played.
We dropped the seed o'er hill and plain, beneath the sun of May,
And frightened from our sprouting grain the robber crows away.
All through the long bright days of June its leaves grew green and fair,
And waved in hot midsummer's noon its soft and yellow hair.
And now with autumn's moonlit eves, its harvest-time has come ;
We pluck away the frosted leaves, and bear the treasure home.
There, richer than the fabled gift Apollo showered of old,
Fair hands the broken grain shall sift, and knead its meal of gold.
Let vapid idlers loll in silk around their costly board :
Give us the bowl of samp and milk, by homespun beauty poured !
Where'er the wide old kitchen-hearth sends up its smoky curls,
Who will not thank the kindly earth, and bless our farmer-girls !
Then shame on all the proud and vain, whose folly laughs to scorn
The blessing of our hardy grain, our wealth of golden corn !
Let earth withhold her goodly root, let mildew blight the rye,
Give to the worm the orchard's fruit, — the wheat-field to the fly ;
But let the good old crop adorn the hills our fathers trod :
Still let us, for his golden corn, send up our thanks to God !

CHAPTER XIV.

HISTORY OF MAIZE, OR INDIAN CORN.

By E. Lewis Sturtevant, M.D.

THE corn-plant is only known as a cultivated plant. When Columbus first reached the shores of the West Indies in 1492, he found *mahiz* grown and used by the Indians, and also in Yucatan upon its discovery in 1502. While Cabeza de Vaca was toiling his intermittent way from Florida to the Pacific coast in 1528 to 1536, he found maize grown in large fields, and stored in cribs, by the natives of those regions. Cortez had previously found maize in Mexico, at the period of the invasion, and at Cempoalla, in 1519, had eaten maize made into bread-cakes, and on the march to Mexico passed amidst flourishing fields of maize. When De Soto invaded Florida in 1539, *maes* occurred everywhere in large fields; and the same year Marco de Vica found maize growing in New Mexico in fields. In 1540 Vasquez de Coronado mentions fields of maize in the valley of San Miguel and also in store at Cibola; and it is also mentioned in Castanedo's Relations for the same date. Alarcon, in 1540, found it growing in his journey up the Colorado River, and Antonio de Espips in 1583 found it under cultivation by the Concho Indians of this region.

When Cartier visited Hochelaga, now Montreal, in 1535, that town was situated in the midst of extensive corn-fields. In 1586 Heriot refers to maize cultivated in Virginia, and called by the natives "*pagatour*;" and John Smith in 1606 describes the Indian method of culture then. Champlain in 1605 found it growing in fields all along the New-England coast, and describes the manner of its culture. Our Puritan fathers found it in store upon their first expedition of discovery, and speak of the deserted corn-fields, for the time was winter. The Five Nations, in 1603, made corn-planting their business before the French arrived in Canada. The Iroquois raised it in such large quantities that in the invasion into the country of the Senecas, in 1687, some 1,200,000 bushels were destroyed. The Indians of Illinois cultivated corn when the country was first described by Marquette in 1673, by Allouez in 1676, and Membre in 1679. In Louisiana they had even invented a hoe for its culture.

This list might be indefinitely extended; for so universal was the use of maize by the aborigines, that its mention is to be found in nearly all the early chroniclers, and it seems never to have been grown as a luxury simply, but rather as a source of supply, and as a staple food. In the southern country, it was so largely grown that many tribes may be considered as agriculturists, rather than as hunters; in the northern countries it shared with the products of the chase the claims of a sustenance. Its merits, too, were quickly recognized by Europeans, and it soon found introduction to Europe, and a wide distribution. It had a strong agency in the settlement of this country, as it afforded relief from starvation to the "Conquistors" in the South, and to plain Miles Standish and his contemporaries in the North.

The Indian made his conquest the more easy by feeding his invaders from the produce of his corn-field, and the parched grain supported him again in his defence. Among the more imaginative Indians of the South, maize became an object of worship, and a means of conferring honor: it formed portions for gifts, and in one instance was poured upon the ground for the trampling of the horses, as an earnest of welcome to the Spaniard. Everywhere the grain supplied food, in many places was parted into a drink, and the leaves and stalks were crushed to secure the juice to be boiled into a sirup or sugar, and the stalks were used to form bags and other material of wigwam use. It is passing strange, that the corn-plant does not appear upon the coat of arms of any of the States whose early necessities it relieved.

In all the references to corn that we find for North America, we find no reference to the amount of crop harvested from a given area; and this seems at first surprising. We read of manuring and fallowing, of the preparation of the ground, of the planting, of the culture, and the storing of the crop. We have some few accounts of varieties, and frequent mention of the uses and modes of preparation. In 1608 the settlers of Jamestown were taught the manner of growing it by the Indians; and in 1621 Squanto, the good-natured Indian friend of the Pilgrims, taught them; and, strangely enough, until quite recently there has been but little change from the Indian methods; and throughout New England generally the cultivation which sufficed the barbarous Indian and the colonist of limited means is deemed by many to be proper now, except the plough has taken the place of the sharpened bough or the shoulder-blade of the moose, the hoe has replaced the

clam-shell, the dung-hill is called upon oftener than is the sea or the stream for its fish. We now store in cribs, rather than in the sacks of our instructors buried in the sand ; yet the Southern Indian had cribs, even as we have now.

It is a valuable reflection this, the antiquity of the cultivation of the corn, and the little progress in the method of its culture which civilization has been enabled to add. It is worthy of thought, this paradox, that in this one case civilization is instructed by barbarism, instead of instructing. Did the Indian attain perfection, or is it ourselves who are satisfied not to progress ? This latter question seems the true one : for the Western farmer has departed from the Indian ways, and meets a greater success ; the progressive farmer here and there in New England has left the track beaten for him by custom, and finds his gain. Yes, it is a fact, the cultivation by the red man was sufficient for him with his resources, but is far from satisfactory for us with our resources. It is time we should follow in the line of civilization, even if we would not be in the van ; and it is folly for us to longer continue in the line traced by barbarians, rather than by an educated experience.

WAUSHAKUM FARM, SOUTH FRAMINGHAM, MASS.

[Written for and published originally in "The Massachusetts Ploughman."]

THE IDLENOT PAPERS.

CHAPTER XV.

COST OF PRODUCING MILK ONE CENT A QUART, OF BUTTER TEN CENTS PER POUND, AND OF PORK THREE CENTS PER POUND, BEEF FOR FOUR CENTS A POUND, AND MUTTON FOR NOTHING, IF WOOL IS THIRTY CENTS A POUND.

AT Winning Farm I have by careful tests demonstrated that milk can be produced for one cent a quart, and a clear though small profit made. More than twice as much profit can be made by converting the milk into butter, even though the butter is sold for ten cents a pound, providing the skim-milk is fed to improved breeds of swine. For producing pork with skim-milk and grass, no breed is equal to the well-bred Berkshire. I will as briefly as possible tell how milk can be produced for one cent a quart, then show how much more can be made by converting the cream of the milk into butter, and finally how the greatest amount of pork can be raised from the skim-milk.

To begin with, we will assume that a farmer has a good farm of 50 acres, with a comfortable house and a barn 36 by 48 feet. This barn will hold not far from 25

tons of hay and the corn-stalks and butts from about two acres of corn. It will probably have a lintel for cows on one side of the "floor," a granary and harness-room, two or three horse-stalls, and hay-mows on the other side. Upon such a farm — if it is a good one — there can be kept two horses and 10 to 15 cows upon hay and grain, providing a partial system of soiling is adopted to help out the pasturage during July, August, and September.

To carry on this farm, even though the farmer be ever so much of a worker, he will have to keep one good hired man at least nine months of the year; the entire resources of the whole farm will have to be devoted to the subsistence of the 10 or 15 cows; all the other crops — vegetables, fruit, &c. — will not bring in more cash than the grain fed to the cows in addition to that raised upon the farm will cost. Now, we will assume that each of the 15 cows will produce 2,000 quarts of milk, besides that used by the farmer's family: this, if sold for three cents a quart, gives \$60 as the gross income from each cow; that makes the total income from the 15 cows, \$900. This, I think, is as good a showing as our best farmers can exhibit.

Against this income of \$900, there must be charged the interest and taxes upon the farm, and other expenses as follows: —

6 per cent on \$5,000, value of farm	\$300 00
Repairs on buildings, $2\frac{1}{2}$ per cent on \$2,000.	50 00
Taxes on farm, \$40; taxes on stock, \$10	50 00
Interest on stock and farming tools	90 00
Wages and board of hired man 9 months, at \$30	270 00
Depreciation on stock and farming tools, value \$1,500, 10 per cent	150 00
<i>Carried forward</i>	<u>\$910 00</u>

<i>Brought forward</i>	\$910 00
Wages of the farmer, besides house-rent, fuel, and produce raised on the farm consumed by himself and family . . .	400 00
(This may seem high, but I would like to hire the man and his family I am writing about for the same wages and other consideration mentioned.)	
Total expense	<u>\$1,310 00</u>
Total income	900 00
Deficiency	<u>\$410 00</u>

In other words, the farmer who owns a 50-acre farm worth \$5,000, with stock and farming-tools worth \$1,500, who keeps 15 cows and sells \$900 worth of milk from them yearly, if he keep a correct account of expenses, instead of receiving \$400 for the services of himself and family, actually works for nothing except house-rent and fuel and vegetables, and pays \$10 per year for the privilege of doing so.

It must be confessed that this is not very encouraging ; and it is no wonder that the boys want to leave the farm, and the girls declare that " they won't marry a farmer."

If my figures are incorrect, I hope some enterprising and industrious farmer will show how much better his actual results are. Let us have all the items of both expense and income.

Now, there is a chance to take a " new departure," which will change all this ; and I propose in this and subsequent letters to show how it can be done. Under the new dispensation, which we will call the " Book of Ensilage," Sylvester Idlenot starts with the same 50-acre farm, divided into 20 acres arable land, 20 acres pasture, and 10 acres in wood, all well fenced, and valued at \$5,000. Time, March 1. He has used plenty of muck and road dust for absorbents, so that he will have two cords of good manure for each animal, 32 cords in all.

A few days ago I called on Sylvester, who is a neighbor of mine, in whom I have taken a great deal of interest. At first I was interested because I saw he was always at work. His motto, like his name, was "Idlenot." From his dropping the final *t* when pronouncing his name, I think he is of French descent; probably a "Limerick Frenchman." Upon further acquaintance I found he had rare good sense. I found him studying over his farm-account for the year past. From the expression upon his countenance I saw he was not satisfied with the results. "Good-morning, Sylvester," said I. "Ah! good morning to yoursilf. It's glad I am to see ye, dochter: 'tis puzzled intirely I am. Perhaps ye can explain the botheration, so that Mary and mesilf can see through it."—"I'll try, Sylvester. What is it?" I asked.

"Well, dochter, 'tis just this: Me and Mary has been married fifteen years this very blessed first day of March. When we were married I had saved up \$750, and Mary had \$250, just \$1,000 betwixt us. Well, Mary, God bless her, she kept right on at work, and she laid up a little over \$100 a year. I kept right on at work too, and laid up me whole wages. (I received \$300 a year and me board.) I clothed mesilf with what I earned doing extras and warrking nights for me master's neighbors. This made our savings \$400 a year. In tin years we had saved up, with what we had when we married, \$5,000, and the interest made it some over \$7,000. Well, we got tired of working for other people, and thought we would have a home of our own: so we bought this farm, and the stock and the tools and all the fixings were all paid for. We had a few hundred dollars left.

"Well, now, I have just been figuring up the last year,

and it stands this away: We have sold milk amounting to \$900. The fruit and vegetables and chickens and eggs have come to just enough to balance the mate, the grocery, and the grain bill. As the incomes and the outgoes are of a bigness we'll let them go together, and say no more about them. When I had got this far without stopping to think, I said, 'Mary, the milk-money is all clear gain;' Mary says to me, 'I don't see it: where is the money?' I began to think again; says I, "there is the \$7,000 in the farm. The year before we bought it we got \$420 intrust, that we would have had if we had had no farm, so that is no profit belonging to the farm; take that from the \$900, and there is only \$480 left. Thin there was the wagis of one hired man, \$15 a month and board worth \$10 a month, that for nine months is \$225, that laves only \$255; thin there is the taxes, \$60, the insurance, \$10, thin the depreciation in the stock and farming-tools, tin per cent on \$1,500, — \$150; thin the repairs on the buildings, 2½ per cent on \$2,000, — \$50, making \$270. Taking that out of \$255, all that was left of the milk money, and I find mesilf in debt to mesilf \$15, and nary a cint of wagis for Mary or mesilf. 'Mary,' says I, 'we have been working hard as iver we could work the whole year for our board, and have paid \$15 for the privilege, and clothed oursilves. All the year we have been working hard arning our *own* intrust money, and giving \$15 for the right to do it.' Now, dochter, what I wants to know is this: ain't there no way for a farmer to do, 'cepting to work for nothing and clothe himself?" I was very much amused while Sylvester was explaining his figures, and wondered how many farmers there are who have kept as accurate an account as he has, and could tell whether they were making any thing or were really working for nothing.

I finally said, "Sylvester, I will tell you how to manage your farm and stock so as to receive good wages for yourself and also for Mary, and something as a profit. How much ready money have you saved up now?" — "Well," says he, "we have a bit over \$2,000; we have each year saved up just about what the interest would be, and worked for our board ever since we bought the farm, bad luck! but it's a good farm too."

"Well, Sylvester, in the first place, you must buy fifty cords of good manure, that will cost you at the railroad-station \$6.50 per cord, — \$325; that will give you 82 cords of manure. Spread that as you haul it broadcast upon 15 acres, that will be about $5\frac{1}{2}$ cords to the acre. After you have got it well spread, come up to my place, and get my Thomas smoothing-harrow, and give it two good harrowings, one each way. The 15 acres will take your ten-acre meadow and the five-acre field where you had potatoes and other vegetables last year: the other five acres, which is the apple-orchard, you can cut the hay early, and then use it as a hog-pasture.

"Now, immediately after harrowing the five-acre field, sow it to spring rye to be fed out green in May. You have now a lintel on one side of your barn which will hold 16 cows; you want to make one on the other side 36 feet long, that will accommodate 12 cows; the other 12 feet will allow for two horse-stalls and a pair of stairs to go up to the granary, which you must move up stairs; this gives you room in your barn for 28 cows and two horses. All the planting you want to do this year is one-half acre of potatoes and a good big kitchen-garden." "Never you mind telling me that," broke in Sylvester. "Go on, docther: I'm listening wid both ears, and so is Mary."

"Now, after you have your manure all out and spread,

the rye sowed, the garden made, and the potatoes planted, you dig a hole into that bank east of your barn, 30 feet wide, and 45 feet long, and about four feet lower than the sills to your barn; wall it up all round, then plaster the walls with concrete, run a wall through the centre, cut off the corners, and carry these concrete walls up above the top of the earth until they are 16 feet high on the inside; then get a carpenter to put a light roof over them to keep the rain and snow out, and you have two Silos which will hold 400 tons of Ensilage, two tons of which is worth more than one ton of timothy hay. You will have to hire some help to build these Silos; and it will take about 125 barrels of cement, besides the labor of yourself and hired hand: you will have to pay out in building them about \$300. Early in May, as soon as your spring rye is eighteen inches high, commence to cut it, and feed it to your cows in the barn; the last week in May cut the grass in the ten-acre lot; as soon as you have got the hay off of it, turn it over, roll it, take my Nishwitz harrow, and harrow it both ways, then plough the rye-field, turning under the stubble and the green second growth. Rye, if cut before heading, grows a second crop. After harrowing that, the same as the sod-land (and, Sylvester, let me right here repeat the old Pennsylvania Dutchman's advice to his son about preparing corn-land: 'Shon! you shust drag and drag and drag until you have him shust right, and den you shust drag him vonce more, and he vill do pretty vell'), I will let you take my Albany corn-planter, and with one horse you can plant the whole 15 acres in three days, at the same time distributing about 100 pounds of Stockbridge corn-manure or some good reliable superphosphate in the drills. I use an equal amount of plaster mixed with the fertilizer. Make the drills about three and a half

feet apart, using from one-half to one bushel of seed-corn to the acre, according to the size it grows. I have a variety, — the Mammoth Ensilage, — which takes only one-half bushel to the acre: the drills want to be four feet apart. It will yield on good corn-land, *well manured*, 40 to 75 tons of green-corn-fodder to the acre: I guess I can furnish you with seed if you want me to. As soon as the corn begins to prick through the ground, you must harrow it all over with the Thomas smoothing-harrow, and follow it up every week or ten days until the corn is a foot high: each harrowing will take one day. When it is about waist high, you want to go through it once with Hussey's Centennial Improved cultivator and horse-hoe; after that the corn will shade the ground so much that there will be no more weeds; when this is done, until your corn is ready to cut, you and your man can change work with your neighbors, helping them in their haying, they to pay you back when you save your corn-fodder: having nothing but the garden to attend to, you will have plenty of time to pay in work for all the help you will need then. About the 1st of September your corn will be in full tassel, which is the time to cut it. You will have to buy you a cutter, which will cost about \$100. You will have to hire a small engine, — three to five horse-power will do, — and a boy who understands how to run it: this will cost about \$25 to \$40. It will take eight men besides yourself to cut the corn-fodder and pack it in the Silos to advantage. It will take about ten days to fill the two Silos. I think you will have enough on your 15 acres to fill them, and have several tons which you will have to shock and cure by drying. When the Silos are filled, you want to put six inches of rye-straw on top of the Ensilage, then lay down on the straw a floor of one and

one-fourth inch spruce plank: on top of this floor put a layer of cobble-stones about a foot deep. As soon as you have done this, plough your corn-land, and sow with winter rye. Sow two bushels to the acre. I will loan you my Cahoon Broadcast seed-sower to sow the rye: with it you can sow the 15 acres in one day, and do it far better than by hand. Harrow it in with the smoothing-harrow, then roll. In the spring, harrow the rye as soon as it begins to grow, and follow it up once a week until it is eight or ten inches high. This harrowing loosens the ground, kills the weeds, and causes the rye to tiller more, thereby increasing the crop from 20 to 50 per cent."

CHAPTER XVI.

SECOND IDLENOT PAPER.

ABOUT two months after my last interview with Sylvester Idlenot, when I advised him to try Ensilage, I saw him coming up the walk to my house, evidently in a botheration. As he opened the office-door I said, "Good-morning, Sylvester. Take a chair. How are Mary and the boys?"

"All well, God bless 'em, I thank ye; but it's in throuble I am intirely!"

"What is the matter, Sylvester?" I asked anxiously.

"Well, dochter, 'tis just this. You know, last March ye happened into my house just as I was figuring up the account for the year, and we had made nothing but shelter and our vittles. Shure, we always had a roof over our heads, and plenty to ate, and comfortable clothes on our backs, and laid up three and four hundred dollars each year, and niver touched the bit of inthrust money our savings was arning. After we bought the farm, and since then, divil a cint have we laid up more'n the inthrust would have been. Well, you, dochter, told me what to do, and I'm a-doin' it; and now we're ruined intirely!"

This sounded rather ominous; and I said, with more

anxiety than curiosity this time, "Sylvester, what *is* the matter?"

"Dochter, I've been following your directions, for I thought it was sinsible; and besides, I'd seen how well your own stock looked that was fed on the insilage; and ses I to Mary, it's thrying it we'll be after doing. So I bought the manure, and I spread it broadcast on the tin-acre field and five-acre lot: the grass 'tis just growing splendid! We sowed the five acres to rye, and up to me shoulder it is, and so thick ye can hardly make your way through it. We are feeding it to the cows, and have been for a while or two."

"Well, don't they do well, and give a good mess of milk?" I asked, interrupting him.

"Niver better, but that ain't the throuble," said he.

"Well, what is it? Tell me, what is the matter, Sylvester?" I asked.

"I'm coming to it, dochter, directly. I'll tell ye immejity. I was at warrk on me siloos. I've got 'em more'n half done already. Day before yesterday, whin I looked up, there right forninst me stood the conthtractor! 'So you are going to thry the dochter's new-fangled feed, are ye, Sylvester?' — 'Yes, indade I am,' I said: 'it is tired I am making milk, and selling it to the likes of ye for less than it costs to make it.'

"'I read all about it in the noosepapers,' said he: 'ye's going to make it for a cint a quart. It's foine business ye'll have making milk for a cint a quart and selling it for three;' and he wunk a knowing kind of a wink as he got on to his wagin, and druv away. Ses I to myself, Fhat the divil is that conthtractor winking like that to me for? and thin I thought about the noosepapers telling all about the siloo and the insilage, and at the head of the whole story was, 'How to projuce milk

for one cint a quart ;' and it sthru^k me all of a suddint. Ah, docther, ye's guv us away wid your noosepapers, and ruined the whole business, bad luck to it! I niver did belave in book-farming, anyhow!"

Sylvester wiped the perspiration from his brow, and looked the personification of disgust. "Why, Sylvester," I said, "how can that be? What harm can there be in writing down our conversation and the advice I gave you, and printing it so that others may profit with us in the advantages which the new system of Ensilage gives? Surely you are not so selfish that you do not want other farmers to share with us the good times which the general adoption of the new system will bring about?"

"No, no, docther: it isn't the farmers that I want to kape in the darkness and throuble they are now in, by any manes; but the milk contractors—may the devil fly away wid every mother's son of them! As soon as they foind out we can make a quart of milk for a cint, not a farden more thin a cint will they pay us for our milk. And that's what's the trouble altogether! Fhat's the use of all your exparimints? The contractor—bad luck to the likes of 'im—will get the oister and lave us the shells like he does now. Shure thim's the b'ys fhat makes their foine living by the sweat of ither men's brows!"

I laughed at this, and proceeded to finish the advice I gave Sylvester last March. "Sylvester," I said, "you are keeping your cows now on rye. All right: continue to feed the rye to them until the first of June, then turn them into the pasture. By that time there will be plenty of feed which will carry them till fall, with the help of a little grain. In fact, keep them as you would if you were not trying the Ensilage system. Finish your Silos. When you have them filled with the corn Ensilage, put

a lintel on the other side of the barn, and in about a month buy thirteen more cows, and keep them in the barn, turning them out every day an hour or two in the yard to exercise. Feed the Ensilage to them twice a day, about a bushel (25 or 30 pounds) to a feed. The two Silos will hold about four hundred tons; that, with the rye Ensilage, will be sufficient to keep fifty cows the year through, if you give to each cow, in addition to the Ensilage, about four pounds of bran or cotton-seed meal daily while she is in milk."

"But, docther, won't the cows and sheep get tired of the insilage, and need a change sometimes?" asked Sylvester.

"I don't see that there will be any need of a change," I replied; "I have fed cattle upon it exclusively for several months, and they like it better and eat it with greater avidity than ever. It is almost the *same* as fresh pasture grass when bran or cotton-seed meal is fed with it, and is certainly as *good* as fresh pasture, as the cattle can eat their fill without labor. When there is plenty of food in the pastures, no one dreams of offering a *change* to stock. You will have but 28 cows, and that is all I advise you to keep; but, as you have the feed for 22 more, you must build a shed on the south side of the Silo, 24 feet wide and 47 feet long; fence in a yard of about one-quarter of an acre of that high, dry ridge east and south of your Silos, and buy 100 breeding-ewes, common merinos, such as I bought last fall, only you need not bother about their breeding. If they are grades they will answer just as well.

"As I am advising you what to do, I will let you take two of my Cotswold bucks to put with them. If they turn out well, you can pay me for the use of them what you think is right. Now you will want to buy six good

brood-sows (any large breed), and a pure Berkshire boar to use on them. You can keep the 28 cows, the 100 sheep, and the seven hogs on the Ensilage which you will raise on the 15 acres. If the contractor tries to beat down the price of milk, you can make butter, and have the skimmed milk to feed to the pigs. If your cows each give 2,000 quarts of milk per year, you can make 200 pounds at least of butter. The skim-milk, the run of the five-acre orchard (you must ring the hogs when you turn them out to pasture), and Ensilage in the winter, will make you at least 500 pounds of pork to each cow. This will give you \$20 for butter, if you have to sell it at ten cents per pound. 500 pounds pork at three cents per pound is \$15. You will also raise a fine calf worth at least \$10 when a year old. This gives you for each cow \$45, or \$1,260 for the 28 head. Your 100 sheep will shear you seven pounds of wool on an average (my merinos average between nine and ten pounds), worth unwashed at least 30 cents per pound, \$2.10 a head, or \$210 on the whole flock. Then you will raise, by the use of Cotswold bucks, 90 lambs or more, which will be worth when four months old, at least \$4 per head; this is \$360 more. Now let us see: your income will be as follows:—

For butter, 5,600 pounds, at 10 cents . . .	\$560 00
For pork, 14,000 pounds, at 3 cents . . .	420 00
28 yearlings, at \$10 apiece . . .	280 00
700 pounds wool at 30 cents . . .	210 00
90 lambs (Cotswold merinos) at \$4 . . .	360 00
Total	<hr/> \$1,830 00

“You must in the future, as in the past, make the sales of fruit, eggs, poultry, and vegetables pay the butcher’s and grocer’s bills, so that there will be to

come out of the \$1,830 the following items of expense:—

Interest on farm, value	\$5,000 00	\$300 00
Interest on stock and depreciation on farming-		
tools, value	1,500 00	150 00
Interest on 13 additional cows, value	520 00	} 111 70
Interest on 100 sheep, "	400 00	
Interest on stock of manure bought, "	325 00	
Interest on Silos, cash paid out, "	300 00	
Interest on sheep-shed, "	150 00	
Total investment	\$8,195 00	
Wages and board of one hired man six months, at \$25	150 00	
Repairs on buildings and fences	50 00	
Taxes and insurance	80 00	
Bran and cotton-seed meal, four pounds daily to each cow when		
in milk	280 00	
Grain for sheep and horses	150 00	
Total expense		\$1,271 70

"This leaves for you and Mary \$558.30."

"Fhat! \$558 and 30 cints! besides intrust and all expinses is it?" asked Sylvester, who had been watching me closely, "and no thanks to the contrhactor; wid butther at tin cints a pound, and pork at three cints a pound, wool at 30 cints a pound, and Cotswold Merriny lambs at \$4 apiece! Shure, that is too low for the lambs anyway. Your lambs, dochter, of the same kind, weighed over 100 pounds apiece whin only five months old; for, d'ye moind, I helped ye to weigh them meself."

"That's so," I replied: "they will be worth from \$5 to \$7 each; so will the butter be worth more than ten cents a pound, and the pork be worth more than three cents a pound. I have put the prices low, in order to show you what can be done by the *system of Ensilage*. Now, Sylvester, you and Mary take hold of this as you do of

every thing you undertake ; and, my word for it, you will think you have found the real ' philosopher's stone.' After you have tried it one year, show me your account. If it is not better than last year, I'll pay the difference out of my own pocket."

"Ye'll not be called upon to do that, docther," said Sylvester ; "and ye can depind upon Mary and me and the b'ys to thry."

CHAPTER XVII.

ANALYSIS OF ENSILAGE FROM THE "WINNING-FARM" SILOS.

By C. A. Goessmann, Ph.D.,

*Professor of Chemistry, Chemist to the Massachusetts State Board of Agriculture,
and State Inspector of Commercial Fertilizers.*

THE sample of Silo corn (Ensilage) consists of:—

	PER CENT.
Moisture at 212°-220° Fahrenheit	80.70
Dry matter left	19.30
	<hr/>
	100.00

This dry matter consists of:—

	PARTS.
Crude cellulose	6.43
Fat ether abstract	0.62
Albuminoids	1.56
Non-nitrogenous extract matter	8.92
Ash (with traces of sand)	1.77
	<hr/>
	19.30

Also an average analysis of the corn-plant in the milk:—

	PER CENT.
Moisture at 212°-220° Fahrenheit	85.04
Dry matter	14.96
	<hr/>
	100.00

	PARTS.
Ash	0.82
Albuminoids	0.86
Fat	0.26
Crude cellulose	4.53
Non-nitrogenous extractive matter	8.49

By comparing the two tables it will be seen that the Ensilage contains over 29 per cent more dry matter than the whole plant in the milk; over 41 per cent more of crude cellulose; over 138 per cent more of fat; over 81 per cent more albuminoids; over 5 per cent more of non-nitrogenous extract matter; over 115 per cent more ash (or mineral constituents).

It will also be seen that the nutritive ratio of the Ensilage is one part of albuminoids to $6\frac{7}{10}$ parts of non-nitrogenous extractive matter (digestible carbo-hydrates). This makes its nutritive ratio a little better than timothy hay, which is, according to Dr. Wolff, 1 to $8\frac{1}{10}$, but not quite as good as average clover hay, which is 1 to $5\frac{9}{10}$. By this analysis Ensilage would seem to be much nearer a perfect food than I have supposed. If the results of careful experiments in feeding coincide with the above analysis, the system of Ensilage is far more perfect and important than I have even hoped.

I shall institute a series of experiments to test this point; for, however satisfactory a chemical analysis may be, the real touchstone is the *feeding value* demonstrated by careful and repeated experiments.

What farmers want to know is not what an article of food is worth *chemically*, but how much it is worth to *feed to their stock*.

My experiments thus far satisfy me that the value of corn-fodder is doubled by the softening and fermentive process which it undergoes in the Silos; that two tons of

it are worth more to feed than four tons of corn-fodder fresh from the fields, or one ton of best timothy hay.

I received the above analysis the last of April, and at once resolved to test it by experimentation. April 29 I selected two thoroughbred two-year-old Jersey bulls, and weighed them. "Rossmore" weighed 960 pounds, "Hero" weighed 890 pounds. "Rossmore" was fed 40 pounds of Ensilage daily, and *nothing else*. "Hero" was fed 40 pounds of Ensilage and three pounds of wheat-bran daily, and *nothing* more. June 2 I weighed them again, and found that "Rossmore" weighed 960 pounds, having neither gained nor lost; showing, so far as one experiment could, that 40 pounds of Ensilage containing over 80 per cent of water was sufficient to sustain in a healthy condition the functions of the animal system, and replace the waste tissue. His hair was smooth, he appeared to be satisfied, and Sylvester thought he was gaining. "Hero" at this time weighed 943 pounds, being a gain of 53 pounds in 34 days, or $1.55\frac{15}{17}$ pounds daily: as it took the 40 pounds of Ensilage to sustain the animal, it follows, that 102 pounds of wheat-bran, fed with the Ensilage, produced 53 pounds of beef (live weight).

CHAPTER XVIII.

HOW TO PRESERVE GREEN CORN FOR THE TABLE.

DURING my visit at "Linden Grove," the home of T. S. Cooper, the well-known importer of choice, high-class Berkshires and Oxfordshire-down sheep (see portrait of Freeland), upon my describing Ensilage to Mr. and Mrs. Cooper one evening, I was surprised and pleased to learn from Mrs. Cooper that she had been Ensiling green corn for a long time for her table. I asked her to tell me how she prepared it, and she replied as follows: "I take fresh ears of green sweet corn, cut the corn from the cobs, pack it down solidly in a large stone jar, cover it on the top with about two inches of salt, put a follower on the salt, and weight it. Whenever I wish to prepare some for the table, I soak it until fresh, or change the water in which I boil it as often as necessary. When it is cooked, I drain the water from it by letting it stand in a colander a few minutes, then season to suit; or, after it is nearly done, the water may be drained off, and nice rich milk added, in which let it simmer until ready to serve."

CHAPTER XIX.

MY EXPERIENCE WITH SUGAR-BEETS. — COST OF RAISING ONE-FOURTH OF AN ACRE, AND THE YIELD.

	DEBIT.	
Seed		\$1 50
12 bushels wood-ashes		1 80
100 pounds salt		50
2½ cords manure at \$6 per cord		15 00
Ploughing twice		2 00
Cultivating and harrowing		1 00
Raking the ground half a day		50
Planting one-fourth day		25
Weeding and thinning, 4 days		4 00
Harvesting, 2 days		2 00
Total		<u>\$28 55</u>

	CREDIT.	
252 bushels at 60 lbs. to the bushel, 15,120 lbs. at \$4 per ton		\$30 24
One-half the value of the manure, salt, and ashes left in the ground		8 65
Total		<u>\$38 89</u>
Cost		28 55
Profit		<u>\$10 34</u>

The piece of land was broken up a year ago last spring, planted that season with potatoes and beans, manured *lightly* in the hill. The beetles ate the potato-vines all up, so that potatoes there were none: the beans bore a very light crop. Before it was broken up, the land produced perhaps half a ton of hay to the acre of fine June grass. This was the first time I ever raised sugar-beets, and the result so well satisfied me that if there were a beet-sugar factory near me I would raise five to ten acres next year. The profit on an acre would be \$41.36, which is

more than any thing else has yielded, except land cultivated by our market-gardeners.

I have no fears but what, by applying $1\frac{1}{4}$ cords of manure to the same piece, I could raise ten to twelve tons another time, for I learned something last season. I had them too thick: the rows were twenty-eight inches apart, and as my men hated to pull up nice plants they left them too close together. Next year I shall plant the rows three feet apart, and thin to twelve inches. I shall not try this piece with $1\frac{1}{4}$ cords of manure, however: I shall put on at least three cords. I raised 225 bushels of long red mangels on one-eighth of an acre, right alongside of the sugar-beets, and on another eighth of an acre side of them 160 bushels of yellow globe mangels. All these pieces were manured alike and cultivated the same.

Now, I want to inquire whether I had better spread about 200 loads of manure on the land I intend to break up next spring, as I get it out next week; or put it in a pile, and spread it in the spring *after* ploughing, the ground being frozen. I cleaned my barn-cellar out in October. The cellar is cemented on the bottom, and the walls pointed with cement. I have made this manure since then. I have thirty-two head of cattle, four horses in the barn and twenty-nine head of swine in the cellar.

I had no idea how much manure I was losing until I cemented the cellar bottom. I have been constantly throwing in dry loam and muck at the rate of one to two loads per day, besides bedding my cattle with sand and the horses with meadow-hay; and now, since the urine of all the animals is saved, the pig-pens which extend under all the stalls and lintels are so wet and soft that the hogs are unable to get from one end to the other.

I feed one hundred pounds of cotton-seed meal, sixty pounds of corn meal, fifty pounds of shorts, and twenty-four quarts of oats daily, besides the food of the swine. I believe that dry muck or loam thoroughly saturated with urine from animals fed as above, and worked up into a perfect mush, is as good to grow crops as the same bulk of solid excrement. Am I right? I should like to know whether I had better spread my manure on the ground, or pile it.

Yours respectfully,

JOHN M. BAILEY.

WINNING FARM, Nov. 1, 1878.

From this experiment I am satisfied that sugar-beets can be raised at a profit. The sugar-factories are now

paying five dollars per ton, which would make the profit on my quarter of an acre \$17.90, or at the rate of \$71.60 per acre; but, in order to realize the greatest profit, the pulp should be returned to the farm, and fed out to the stock thereon. By the system of preserving cattle-food in Silos, this can be done most economically. A small Silo ten feet wide, twenty feet long, and ten feet deep, will hold about sixty tons of pulp. By covering it with a little straw, and upon that a flooring of plank, with weights upon it, the same as in the Silos of corn Ensilage, it may be kept for a long time. The beet-pulp, containing as it does all the nutrition except a part of the sugar, would be an excellent food to feed with the corn Ensilage. It is also a very good article of food for swine by itself.¹

In regard to the manure, I have demonstrated by several careful experiments since the above was written, that the best time and way to apply manure is when you have time, and with a broadcast manure-spreader.

¹ I have learned, since writing the above, that the best way to raise sugar-beets is to have the rows eighteen inches apart, and to thin to nine inches.

CHAPTER XX.

SUMMARY.

To sum up, I will say that large Silos 40 to 50 feet long, 15 to 18 feet wide, and 16 to 24 feet deep, are the cheapest: they will not cost more than one dollar for each ton's capacity. As two tons of Ensilage are worth more than one ton of English or timothy hay, the comparative economy of Ensilage is at once manifest. They require no repairs, and if properly built will last for ages.

The cost, therefore, of storage-room for Ensilage is about six cents per ton yearly. In order to store its equivalent of hay as cheaply, a barn to store a hundred tons of hay would have to be *built for two hundred dollars*. My plans of building Silos are cheaper than to dig pits in the ground. The small pits which are used in France, and described by Charles L. Flint, Secretary State Board of Agriculture, in his last report, would cost much more to construct, the labor of filling and weighting them be much greater.

Since the publication of the last State Agricultural Report, I have had the pleasure of showing my system of Ensilage to Secretary Flint. After critically examining the Silos, the Ensilage, and the stock fed upon it, he declared "that the system of Ensilage would work a perfect revolution in agricultural methods in this country." The system of Ensilage reduces the comparative value

of good timothy hay to four dollars per ton, and of hay-barns to two dollars for each ton's capacity. The labor of feeding is lessened very materially; the health, condition, and appearance of the stock is immeasurably improved. In short, it will bring about, upon its general introduction and adoption, an agricultural millennium — almost.

CHAPTER XXI.

EFFECT OF ALCOHOLIC FERMENTATION IN ENSILAGE UPON "GILT-EDGED BUTTER."

THE following letter was received from a gentleman with whom I have had considerable correspondence upon the subject of "Ensilage."

SODUS, WAYNE COUNTY, N.Y., April 16, 1880.

MR. JOHN M. BAILEY.

Dear Sir,—Yesterday I received a visit from Professor L. B. Arnold, the dairy-writer. The subject of "Ensilage" came up, and its effect on "*gilt-edged butter*," &c. He is very strong of the opinion that the alcoholic fermentation that is begun will injure the fine flavor and texture that is desirable in my trade. I am very anxious to read your book so as to clear up these points; and, if there is any thing further that you can say on the subject, I would be very glad to hear from you.

I haven't got that copy of the paper with your article, "How to produce milk for one cent a quart, butter for ten cents a pound, beef for four cents a pound, and pork for three cents a pound," yet.

Respectfully,

A. J. RICE.

P. S. Just received and read it.

As Professor Arnold is so great an authority, as he is supposed to know every thing concerning dairy matters, it will doubtless be deemed presumptuous in me to say, and attempt to prove, that the learned professor is mistaken. Let us consider through what organs, changes,

and circumstances the small amount of alcohol (which is found in the Ensilage) passes before it can reach the butter.

In the first place, the alcohol is only an *incident* to the great change which has been taking place in the Ensilaged forage. This change, which is so important and so useful, is the conversion of the starch contained in the plants into sugar. The formation of alcohol is only a nutritive barometer which tells us that sugar has been formed. The odor of alcohol is hardly perceptible until after the Ensilage has been exposed to the action of the oxygen of the atmosphere twelve to twenty-four hours.

Therefore, if the professor is correct, it is in the power of the dairyman to prevent the formation of alcohol by feeding direct from the Silo without allowing the alcoholic fermentation to take place. Thus, if an evil, it is easily avoided.

In the second place, the *small* amount of alcohol present in the Ensilage (I have never seen any of my cows intoxicated) is mixed with the saliva during the process of mastication, and passes with the Ensilage into the first stomach, or paunch, thence into the second stomach. It is then re-masticated by chewing the cud, and passes into the third stomach, thence into the fourth stomach, where it is digested.

When cows are fed upon Ensilage, I have noticed that their breath is particularly sweet, as if fed upon the sweetest grasses. From the stomach it passes into the intestines, from which that part of their contents necessary for the nourishment of the animal economy is taken up by two sets of vessels; first, the blood-vessels of the intestines, and passes through the portal vein to the liver. There the portal vein is divided and subdivided into an infinity of minute branches as they reach the lit-

the glandular lobules which compose the liver. Here they break up into a plexus of microscopic vessels as fine as those which originally absorbed from the intestines the nutritive matter with which they are filled. These minute vessels fill the entire substance of the liver with a vascular net-work. Then these little vessels collect together again, and unite into larger ones, until at last they leave the liver as the hepatic vein, which conveys the nutritive matter called chyle. Chyle is also absorbed by the lacteal vessels, and conveyed by the thoracic duct to the sub-clavian vein, and by both sets of vessels is conveyed into and finally mingled with the venous blood returning to the heart. By the contraction of the right auricle it is forced into the right ventricle, which in turn contracts, and forces the blood into the pulmonary artery, which conveys the blood, chyle, and — alcohol? — to the lungs. There this artery divides into numberless branches which penetrate and encircle all the minute spaces between and about the air-vesicles. Here the blood is subjected to the action of the air which is inhaled by the lungs. Now, alcohol is very volatile; and if any of the alcohol has got thus far with the blood on its way to the milk, there can be no doubt that it would all be thrown off with the expiration of the breath.

But, having followed it thus far, let us go clear through to the churn, whether the alcohol keeps up with us or not.

From the lungs the blood is returned to the heart, which by the contraction of the left ventricle forces it all through the system. A large amount of blood is carried to the milk-glands. The milk-glands' office is to *secrete* milk. They secrete nothing else which is in the blood excepting those elements which constitute milk, — providing the animal is in a healthy condition.

But we will suppose, for the sake of the argument, that the alcohol is secreted by the milk-glands, and is drawn from the udder mingled with the milk. A portion of it rises with the cream, and is churned. Of course a large portion of this alcohol, which has got thus far, must remain in the buttermilk: the remainder must be so infinitesimally small that it could have no perceptible effect upon the butter.

It is evident that the professor means, when he says that the "fine flavor and texture" will be injured by the alcohol, that this injury is accomplished by the bodily presence of alcohol in such a quantity as to destroy the integrity of the butter globules; in other words, to "cut" the butter as oil is "cut" when it is shaken in a bottle with *strong* alcohol.

Now, this alcohol, which goes all the way through the various organs of the cow until it is found in the butter, — be the amount greater or smaller, — certainly cannot be very high "*proof*;" and dilute alcohol has no power to disintegrate butter, for you cannot "cut" ever so small an amount of any kind of oil with alcohol the strength of which, at once small, grows beautifully less by being subjected to unlimited dilution every time the cow drinks, and to evaporation every time she breathes.

There are millions of *excretory* ducts, organs, and glands, in the animal organism, whose office it is to remove from the system the waste tissue and such useless substances (alcohol for instance) from the system as may have been taken up by the absorbents. Does Professor Arnold expect he can run alcohol through a cow with these millions of leaks for it to escape by, and catch it in the milk-pail strong enough to disintegrate butter?

But the milk-glands are not *excretory*, but secretory

organs, whose office it is to secrete milk, not to remove useless matters from the organism. Even if an infinitely small amount of alcohol could get into the milk (which is absurd), and if it had the power to disintegrate or "cut" (in a measure) butter (which it would not), I fail to see how it could injure the flavor (and every thing but the pure alcohol would be there anyway). Why, alcohol is the vehicle in which the most delicate flavors are preserved, while the sweetest odors of the roses of June are saved by incorporating them into alcohol.

I think I have demonstrated, first, that if the pure alcohol gets into the milk it could do no harm to the flavor of the butter; second, that it would be infinitely diluted, so as to be powerless to affect the texture; third, that the amount would be infinitesimally small, that it could not be detected; and, fourth, that none could get there at all.

Now, my friend Rice, let us prove this thing by actual experiment. Give to each of your cows daily a tablespoonful of alcohol (which is more than there is in a cow's daily ration of Ensilage); sprinkle it upon their food; examine the butter critically which is made while the alcohol is being administered: if it is injured in flavor or texture in the least, the professor is right, and I am wrong; if, on the other hand, it is uninjured, why, for once he is mistaken.

CHAPTER XXII.

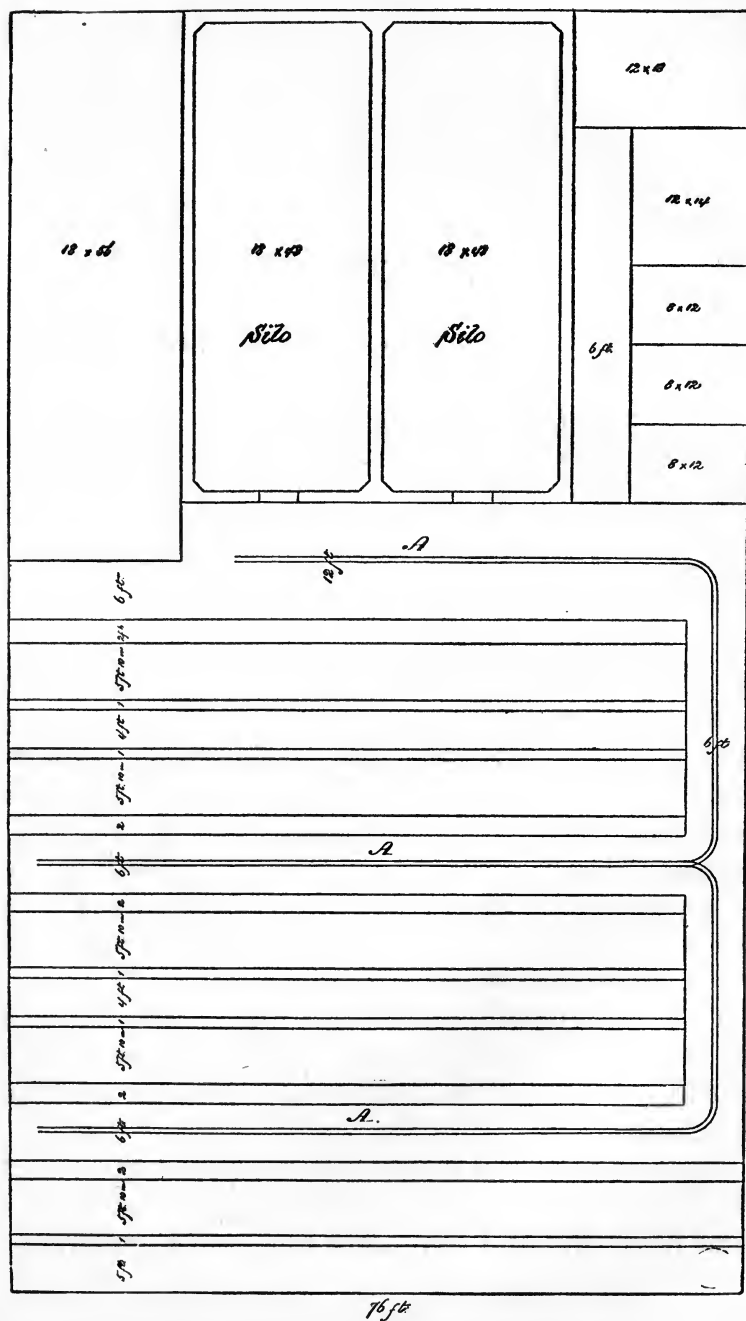
MODEL DAIRY STABLE ADAPTED TO THE SYSTEM OF ENSILAGE.

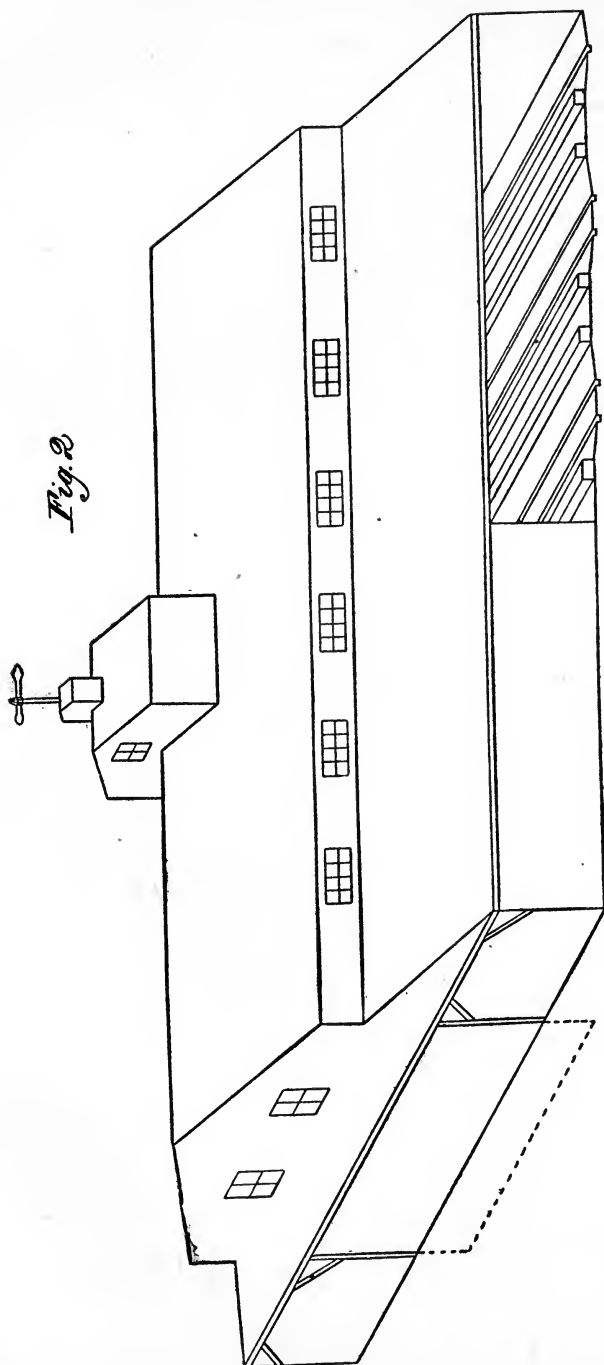
FIG. No. 1 (see next page) shows the ground-plan of a dairy establishment 76 feet wide, 127 feet long, capable of accommodating 118 cows, the necessary young cattle if dairy stock is to be raised, or, if cows are bought, ample room for a flock of 100 sheep, together with their year's supply of forage. There is an engine-room at the right-hand corner, 12×18 feet; next, a 12×14 feet milk and butter room, small shaft enters to attach churn to. Next, three box-stalls, 8×12 feet, opening out of a passage-way six feet wide, which leads from the principal feeding-floor to the milk and engine room. The milk and butter room is sheathed up on the outside with well-seasoned, planed, and matched lumber, and plastered on the inside, with double doors to prevent any odors from entering. The floor of the engine and butter rooms, and of the entire establishment, is cement.

A, A, A, represent an elevated track, upon which a box holding Ensilage enough to feed 25 cows is suspended. This track is overhead in the centre of the feed-floors.

The first floor into which the Silos open is 12 feet wide; next to this is a manger $2\frac{1}{2}$ feet wide; next is the lintel floor, four feet ten inches wide; next, gutter, one

Fig. 1





foot ; next, passage-way, four feet ; next, gutter, one foot ; then another lintel, five feet ten inches ; next, a manger, $2\frac{1}{2}$ feet (by mistake it is drawn as two feet : the lintel floors are also drawn $5\frac{1}{2}$ feet wide, they should be 4 feet 10 inches to 5 feet wide) ; now comes feed-floor from which two rows of cows are fed ; between this floor and the next are two lintels, with mangers, gutters, and passage-way as above ; then comes the last passage-way or feed-floor ; upon one side of this floor the lintel extends clear across the structure. The space 18×56 feet on the left of the Silos may be used as a sheep-shed, or be subdivided to suit for the keeping of calves, &c.

Fig. 2 is an elevation of the same, showing the general shape of the superstructure, also position and an end view of the mangers, position of the gutters, which should be about six inches deep ; also sloping floor upon which the cows stand ; this floor should incline towards the gutter, one inch at least to the foot. On this side of the stable there should be three sliding doors, one at the corner, the others in centres of the double lintels. They should be nine feet wide, so that the manure can be loaded upon a manure-spreader or cart, and be hauled directly to the fields, and spread upon the land.

The dotted line at the left hand shows that portion of the Silos which is under ground. This figure is drawn with the posts 16 feet high, which is higher than is necessary : 10 feet is ample. The Silos are 18×48 feet inside, and 23 feet deep : they will hold 1,000 tons of Ensilage, which is sufficient to feed 100 cows one year. The rye Ensilage, which can be raised upon the same land as the 1,000 tons of corn Ensilage, will furnish plenty of feed to keep the other 18 cows, the calves and young stock, or 100 to 150 sheep.

Fig. 3 shows how the travelling feed-box may be

constructed. The bottom is sloped up at the end; the head-boards can be taken out. A 12 to 16 tined fork, such as is used to handle charcoal, may be used to feed with. A little experience will enable the feeder to measure upon the fork the necessary amount of Ensilage to each cow. If the IMPROVED Ensilage is

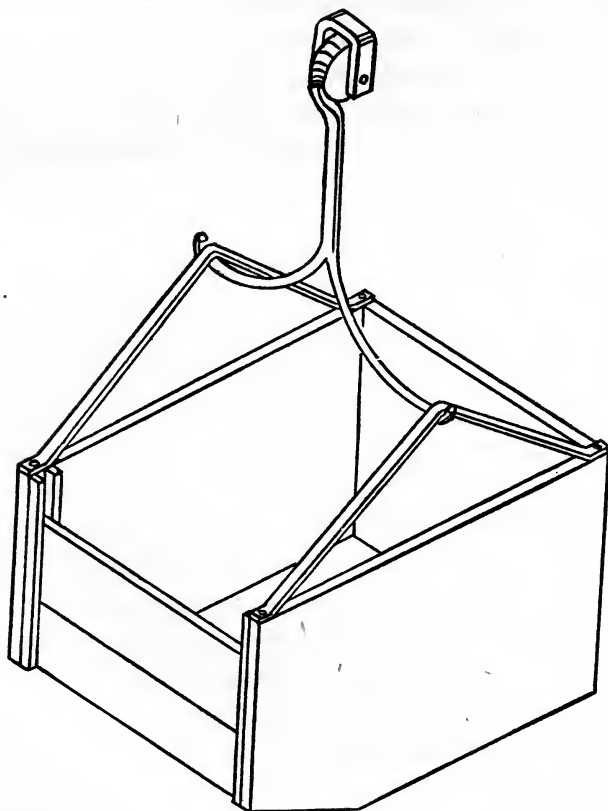


FIG. 3.

used, it will not take one man more than one hour to feed the whole 118 cows. If the grain be fed separately, it will take at least an hour to feed the grain alone. This feed-box is made four feet long, $2\frac{1}{2}$ feet wide, and $2\frac{1}{2}$ feet high.

This dairy establishment can be built, Silos and all, for less than one-half the cost of the necessary storage and stable room, when the same amount of stock are kept upon hay and grain.

The corn-fodder and green rye necessary to keep the 118 cows, calves, and yearlings or sheep, *can* be raised upon 30 acres of good land, while upon a hay and grain diet it would require at least 118 acres of the very best land to keep the cows alone.

Ensilage will re-people and restore the old deserted farms of New England. Thousands of these farms, with comfortable buildings, can be bought for less than half the improvements would cost.

The hitherto insurmountable difficulty has been to get a stock of manure to begin with, there being none for sale in the back counties, and the transportation from the cities would make it cost too much. I propose to show how that obstacle can be overcome. Let the purchaser of one of these old farms commence operations in the spring. He will require a pair of good strong horses, and need a couple of cows, a dozen or two of fowls, and ought to have four good breeding-sows and a Berkshire boar. Turn the cows and the hogs out to pasture; cut down and burn the bushes upon the best of the old grass-fields; the last of May and the first of June break up 15 acres, turning under the green growth; if there is a good thick sod, it would pay to sow broadcast 100 pounds of nitrate of soda to the acre about the 20th of April: this will stimulate the grass to grow, and give a much larger green crop to turn under. After breaking, harrow twice with the Randall disk-harrow, then with the smoothing-harrow. Plant in drills four feet apart, using half a bushel of Mammoth Ensilage seed-corn to the acre, and distribute in the drills 200 to 300 pounds of Bradley's

X L phosphate, or any other equally good and reliable fertilizer, if you can obtain it. I have used the X L phosphate for many years, and it has never disappointed me. On land where there is but little grass to turn under, better broadcast from 200 to 300 pounds of phosphate, and harrow it in before planting. The corn comes up large and strong, with a dark, healthy green color: it soon carries it out of the way of the cut-worm, and is sufficient for its rapid growth until the rootlets reach the mass of decaying vegetable matter turned under, which is one of the *best* fertilizers to make an immense growth of corn. The corn will be ten days earlier, and twice as large, for the phosphate. In short, about 200 pounds of standard fertilizer to the acre in the drill will pay, no matter how much stable-manure you may have. The labor saved of preparing, composting, and distributing the stable-manure will pay for and apply the phosphate, so that whatever fertilizing material there is in the phosphate actually costs nothing.

15 acres, planted and fertilized as above, will produce *at least* 300 tons of corn-fodder. After planting is finished, build two Silos after the plan on page 73, but larger, say 15 feet wide, 12 or 15 feet high, and 30 to 35 feet long: they will cost about \$80 to \$100 for cement, lumber, and extra labor in laying the wall, besides the labor of the farmer and his team. Now the man who has followed my plan thus far, and Ensilaged his corn-fodder, will find himself, at the approach of winter, with ample forage to keep 30 cows the year round, or to winter 60 head, or five cows and 250 to 300 sheep. If he has money enough, and his wife is a strong and able help-mate, and they fancy dairying, let him buy 25 good new-milch cows, sell butter, and follow the advice given Sylvester with swine.

If he has but little money, or does not like dairying, let him take sheep to keep upon shares, saving the best ewe lambs. The sale of wool and ram lambs will give him a good revenue. In the spring, if he has used, as he should, plenty of dry muck or loam for absorbents, he will have a pile of manure which will make the old field smile. Thereafter pursue the course laid down (see page 37), — sow winter rye (applying the stable-manure broadcast during the fall and winter), to cut and Ensilage in May or the first of June, then plough at once, and drill in the corn with phosphate. Every year will witness increased fertility, more stock, larger crops, and greater prosperity.

CHAPTER XXIII.

CONCLUSION OF THE BOOK OF ENSILAGE.

IN conclusion, fellow-farmers, let me tell you why I have written this book. In the first place, I am actuated by an earnest desire to do all I can to improve the condition of the American farmer. His life has been too long a life of toil and drudgery. He has had little if any time for social enjoyment or intellectual improvement. Hard work continuously, accompanied by the most parsimonious economy, has been the only way by which he could hope to acquire a competence for his old age. In this fierce struggle oftentimes the farmer's wife has had the hardest lot of the two; working from early morn until late at night, the slave of a horde of hired men the profit on whose labor, by the old systems, was so slender that the expense of a hired girl would have put the balance on the wrong side, till at last, weary and worn, too often she lies down to her last sleep when but half way on the journey of life; leaving a family of children to grow up as best they may, without any of those tender and hallowed influences which ought to surround every fireside, and make its bright and happy memories in after life a golden shield of protection to keep them from straying from the right way wherein there is happiness, joy, and peace.

The boys grow up. They hate farming: they go to

the city, and join the already crowded trades, professions, or occupations ; and, in ninety cases out of one hundred, their lives are failures.

The girls declare they "won't marry a farmer!" (That is one reason why "the boys leave the farm.") They go into the factories, shops, and to — God knows where! let us hope he will watch over them, and guide their footsteps to something better than that which awaits too many who go to the city fresh and pure as the air on their native hills, to meet disappointment and privation, till at last they sink out of sight, ruined, — lost!

What is necessary to change all this, is larger crops, more and better stock, and consequently greater profits. This will give the necessary leisure for improvement, for rest, and recreation.

By adopting the system of "Ensilage," the labor of a farm can be so systemized that these opportunities can be improved, and the farmer's life become in fact, what it has always been in theory, and sometimes in practice,—the most independent and honorable of any class.

Secondly, Since I opened my Silo, and the papers all gave more or less accurate and detailed accounts of my success in preserving corn-fodder in its green state, I have received an immense number of letters from all parts of the country, asking me to "please give them a little more information '*how*' I did it," &c. Well, I have answered several hundred ; I hated to refuse or neglect so civil a request from so large a number of the very men whom I most respect ; but it had come to this pass, that I had got to employ an amanuensis, and devote my whole time to diffusing information through the mails, or refuse to answer nine-tenths of the inquiries.

Several hundred years ago they used to diffuse knowl-

edge by the means of manuscript sent to parties desiring it; but it soon struck me that in this present enlightened Ensil-age it was not exactly "up to the times!" I have therefore jotted down, as I have had leisure, what I know about the system. I feel diffident in thus giving instruction how to proceed, for I know I have much yet to learn; but the farmer who carefully studies this book will know a great deal better how to go to work than I did when I began; and my cattle and sheep all told me to-day (May 25) that it "was the greatest kind of a success!" But then, my stock like me, and are doubtless partial.

CHAPTER XXIV.

LATEST RESULTS IN PRESERVING AND FEEDING.

SINCE the first edition of the "Book of Ensilage" was published, I have learned several things connected with the system, which I consider of importance. First, I have learned that it is unwise to try to raise two crops upon the same land in one season, unless that land is in a high state of fertility; and even then I believe that it will be better to raise one big crop, and devote the other to fertilization. I shall therefore try the following plan this fall and next season. As soon as my Ensilage corn is cleared off of the ground, I shall drill in rye with a one-horse grain-drill having five hoes, two of them on each side being attached to wings like the side pieces of an ordinary cultivator, so that the drills may be widened to equally distribute the drills between the rows of corn stubble, which are undisturbed whatever distance they may be apart. At any time during the winter, while the ground is frozen, a roller or drag will knock down and break off the corn-stubble. In the spring, harrow with a smoothing-harrow, or, what is better, with the "*new broad-cast grain and corn cultivator*."

The latter part of May I shall turn under the green rye, just as the heads are making their appearance, and drill in "Mammoth Ensilage Corn," with 200 to 300

pounds of best superphosphate to the acre. This green-manuring, with the fertilizer to give the corn a start, will bring a heavy crop of fodder.

Some of my best corn this year was raised upon an inverted sod, with no manure save 250 pounds of phosphate in the drill.

Do not understand that I shall not use stable-manure. I shall apply it broadcast during the fall, winter, and early spring, upon the rye, using "Kemp's Broadcast Manure Spreader."

I am in receipt of many inquiries as whether it will do to put fodder which is partly dry into the Silo, or not. My experience with rye answers this question perfectly. Owing to delays, I did not get ready to ensilage my rye this season until the 12th of June, at least two weeks later than it should have been. The grain was two-thirds formed in the heads, the straw was partly turned, and altogether it was too ripe; but, as an experiment, it is much more valuable than it would have been had the rye been in its most succulent stage (we all know it will keep if ensilaged in that stage). The weather was excessively hot and very dry. I cut the rye, and for two days attempted to pack it in one of my Silos; but it was so dry it would not wilt enough to *pack*. I was satisfied that the mass of Ensilage would contain so much oxygen that it would mould and spoil if put in in that manner. I therefore attached a hose to the stable water-pipe, and run a spray of water upon the cut rye as it fell into the Silo: this thorough wetting caused it to pack solidly. I kept a horse constantly walking upon the rye, which, by the way, is the most economical way of compacting in Silos as large or larger than mine. I also mixed two and a half acres of heavy clover and blue-grass with the 10 acres of rye. I did not open this rye and grass Ensi-

lage until I was ready to fill the balance of the silo with corn Ensilage.

On Sept. 24, upon removing the weights and the plank covering, there was found a layer of about an inch in thickness of rye Ensilage, which was somewhat mouldy. There was no unpleasant or musty smell, however, to this layer; and, when fed to the cows, they seemed to relish it. Directly under this thin layer the *Ensilage was perfect*, not the slightest mould, fresh, and with a delightful odor, excepting that it was somewhat too strong of alcohol. A large basket of it was taken to the cows, which had been at pasture all day, had been fed with all the cut green-corn fodder they would eat, and had received their evening grain-ration; no sooner was it within their reach than they grabbed the Ensilage as if they were famished, and swallowed it as if it were the sweetest morsel, never stopping an instant until it was all gone. The next morning we commenced filling in the corn on top of the rye. Thus, from a threatened failure, we gain a valuable lesson; and that is, to *wet* the forage if it is not green and succulent.

The first edition of 2,000 copies of "The Book of Ensilage" is sold (or this new one of 5,000 copies would not have made its appearance), and has received a most favorable reception from the press of the country and the public generally. I am not troubled that a very few scientific men have attempted to indirectly criticise it, saying: First, "We have known all this matter before this Bailey tried it." Second, "It is absurd to suppose that the process of Ensilage improves the forage." Third, "It is doubtful whether it has any advantages over drying. And between the lines they plainly say, "We had nothing to do with demonstrating the practical utility of this system in America,

THEREFORE there is nothing in it worthy of notice. *We* have been trying this 30 years to effect something by preaching 'deep ploughing,' underdraining, beet-sugar, and many other things" (all of which have fallen still-born upon the general agricultural mind), "and the only monuments we have to point to thus far, are the 'beat' sugar companies."

To the first criticism people say, "If this is so, why have you hidden your light under a bushel all these years, while we were groping in the darkness?"

To the second criticism, I will only ask my scientific friend if he has ever thought of the difference between leavened and unleavened bread, and if the leavening does not add to its *food* value, — whether it increases its *intrinsic* food elements, or not?

In reply to the third, I will take the liberty of quoting Professor Knapp of the Iowa State Agricultural College, in a recent article: —

"In this climate the forage-plants of most luxuriant growth are coarse and succulent, not easily cured, and when dry contain much woody fibre. In their green state they are an excellent food for stock, with little waste; in their dry state a considerable proportion is indigestible, which, with the parts animals reject, constitutes about 40 per cent of the whole. The proportion of innutritious parts depends much upon the kind, coarseness, time of cutting, manner of curing, storing, &c.; but it is safe to place the range at from 15 to 50 per cent. To this should be added liability to damage by wet weather, owing to the long time required to cure such crops in the field. I emphasize the forage-crops, because in my judgment the future progressive agriculture largely depends upon the utilization of them. A ton of green-corn fodder can be grown ready for cutting for ten cents, not including interest on land. On rich land it can be grown for six cents per ton. This includes ear and stalk as it stands in the field ready for the cutter. The experiment by Wolff has shown, that, when cut green early in August, the amount of crude fibre is less than five per cent. Could it be cut fine, and preserved in this condition, the practical saving of material would be over 30 per cent, not estimating for damage in curing by reason of storms.

Another important consideration, impossible to estimate by percentage, is the higher health of animals having rations of green food.

"The consumption of a large amount of dry corn-fodder, or even enough for daily subsistence, has not proven conducive to health. If we consider economy of food and health of animal solely, the balancing of considerations must largely favor Ensilage."

Green grass and other forage-crops contain over 80 per cent of water; in the process of curing by drying, about 70 per cent is evaporated. Now, this 70 per cent of water carries with it a large amount of valuable nutrition. That which passes off is just what makes the difference between June butter and winter butter. If it does not lose by drying the first time, how does it happen that it loses so much by drying the second time, after being wet? The *wetting* does not injure the forage, else cut feed would be injured by being sprinkled, and steaming fodder would be utter ruin. It is the *drying*, after the wetting, that robs the forage of its value. The water which is dried out of the forage leaves it in the shape of *hay-tea*, and the first "drawing" is the strongest.

Do not be alarmed if the cut fodder heats as you are filling the Silo. Mr. Potter allows his Ensilage to "heat" before he attempts to compact it. Sufficient moisture and pressure will stop the fermentation at any time. Do not think it is not preserved, with all its nutritive elements not only unimpaired, but improved, because it does not look as freshly green as when waving in the fields. There are some persons who are so difficult to suit, that they are not satisfied unless they can find under the lid of each can of preserved fruit a button-hole bouquet of fresh peach and apple blossoms.

The true test is, will the cattle eat it, and do they thrive upon it? Mr. Potter's clover Ensilage comes out

of his Silo in the form of a putty-like substance: nevertheless his stock thrives better upon it than upon clover fresh from the fields.

Ensilage has no tendency to bloat or scour animals.

M. H. Simpson, President of the Roxbury Carpet Company, at his farm in Saxonville, Mass., has built Silos after my plan, and has ensilaged several acres of Mammoth Ensilage Corn, the stalks from 30 acres of field corn, and 35 acres of heavy rowen. He has opened his Silo, and is feeding his ensilaged rowen to his cows and his *horses*, and they eat it with a keener relish than any other food. I have not raised the 75 tons of corn-fodder upon an acre yet; but from my experience this season I am more than ever convinced that it can be raised, and I still confidently expect to accomplish it before many seasons. Encouraged by the distinguished approbation of my fellow-citizens and fellow-farmers, I shall continue to experiment. He needs be a bold man who ventures to say, in this day of improvement and progress, that such and such things cannot be accomplished by intelligent and persevering effort.

CHAPTER XXV.

FATTENING STEERS, FEEDING SWINE, METHOD OF FEEDING,
WARM WATER FOR STOCK, ETC.

IN the fall of 1879 I had three yearling steers come down from New Hampshire, where they had been at pasture, "spring poor," as the saying is. One was a Jersey; the second, half Ayreshire, the first calf of a Jersey heifer less than two years old; and the third one, a native. They were very thin,—so reduced in flesh that I thought it very doubtful about their living through the winter. From their return, Oct. 15 until Dec. 3, I tried, with the best of hay, roots, and grain, to make them gain, but with no perceptible success. On the 3d of December I opened my Silo of Ensilaged corn-fodder, and commenced to feed them with Ensilage and a small quantity of wheat-shorts and oil-meal. I gradually increased the ration, feeding no more than they would eat up clean. They soon began to gain; their hair looked better; they handled better. The improvement, at first slow, rapidly increased until, on the ninth day of March, I sold them for beef. Upon being slaughtered the next day, they dressed 1,486 pounds (meat, hides, and tallow).

On the 12th of October, 1880, I opened my Silo, which was filled the preceding month. The Ensilage was found to be perfectly preserved,—in color a much darker green than my Ensilage of the previous year,—owing to the corn being cut and packed in the Silo in a younger and more succulent stage. I am more than ever satisfied that the proper time to cut the corn-fodder is

when it is in blossom. Professor Goessmann writes, that the "corn-plant contains the greatest amount of nutriment just before the tassel appears." He may be right if the forage is to be fed directly from the field. I cannot but think, however, that there would be a loss in cutting it so early for preservation by Ensilage. I do not think there can be much loss even if some of the most forward stalks have ears formed, and the kernels in the milk. The yield will certainly be greater, as at that time there are many smaller stalks and suckers which are still growing.

My method of feeding is as follows: I remove from the Silo 50 pounds of Ensilage (about one cubic foot) for each grown animal daily, mixing one pound of oil-meal or wheat-bran to every 10 pounds of Ensilage. I have a large box standing upon the barn-floor, in which I mix it and let it stand about twenty-four hours before feeding. By that time it is quite warm: the grain addition has had time to become soft, and its digestibility is undoubtedly increased to a great degree. There is in every 50 pounds of Ensilage about 40 pounds of water, — nearly all the animal requires. It is a great advantage to have this amount of water *warm* when taken into the stomach. There has been no labor or fuel expended in warming it, which is quite an item. When animals are allowed to drink ice-cold water in winter, there is quite a large percentage of the food which would produce fat consumed in raising the temperature of the water they drink from freezing cold to blood heat.

When I opened my Silo Oct. 12, 1880, I weighed 20 head of stock, and commenced to feed them upon the Ensilaged corn. They were all quite thin, having been upon a very poor pasture all summer. They could by no means be called a thrifty lot of cattle, or a lot from

which much gain could be expected from their condition, age, or breed.

Nov. 15, I weighed them again. During this time they were fed 1,000 pounds of Ensilage daily; and during the first 18 days, 100 pounds of cotton-seed meal daily. During the last 15 days they were fed 100 pounds of Brewer's sprouts in lieu of the cotton-seed meal. I should have fed more sprouts; but 100 pounds were all they would eat.

Their breeding, condition, age, and weights are given in the following table:—

No.	DESCRIPTION.	AGE.	WEIGHT IN POUNDS.	WEIGHT IN POUNDS.
			Oct. 12.	Nov. 15.
1	Grade Jersey, in milk, fair condition	14 yrs.	1,047½	1,052½
2	Registered Jersey, in calf 7 months, fair condition	15 "	945	967½
3	Jersey cow, calved Oct. 24 (calf weighed 65 lbs.), since which she has given 12 to 14 qts. of milk daily; fair condition	4 "	1,000	875
4	Grade Hereford heifer, thin condition,	2 "	790	890
5	Native heifer, fair condition	2½ "	925	927½
6	Native cow, due in February, very thin condition	15 "	900	925
7	Jersey bull, thin condition	4 "	1,205	1,250
8	Jersey heifer, fair condition	10 mos	345	375
9	Jersey cow, in milk, thin condition, due in January	4 yrs.	750	780
10	Jersey and Ayrshire heifer, in milk, thin condition	2 "	715	730
11	Grade Jersey heifer, very thin condition,	2 "	620	682½
12	Native heifer, due in March, fair condition	2 "	900	922½
13	Jersey heifer, thin condition	1½ "	490	520
14	Grade Jersey heifer, fair condition	6 mos	280	300
15	Grade Jersey heifer, very thin condition,	2 yrs.	550	612½
16	Grade Ayrshire, very thin condition	1½ "	570	640
17	Jersey bull, very thin condition	2 "	950	1,005
18	Jersey bull, very thin condition	2 "	880	960
19	Jersey bull, thin condition	6 mos	190	210
20	Native heifer, in milk, thin condition	2 yrs.	730	745
21	Jersey calf, dam No. 3, born Oct. 24, weight at birth, 65 lbs. . . . .	. . .	. . .	90
	Total weight in pounds . . . . .	. . .	14,847½	15,585

Total gain	737½ lbs.
Gain per head	35.12 "
Gain per day, per head	1.06 "
Greatest gain per day, No. 4.	3 "

The gain in weight, however satisfactory under the circumstances, does not convey an accurate idea of their real improvement. It is a well-known fact that there is a much larger proportion of water in a poor animal than in a fat one. The first change which takes place when fattening begins is a decrease in the amount of water contained in the tissues of the animal; and the increase in fat, however considerable, does not always make up for this loss of weight.

It is the opinion of all who inspected the above animals at the beginning of the experiment, as well as since Nov. 15, that the increase in weight does not equal the improvement in the quality of the beef. It should also be borne in mind that the season is the most unfavorable for gain, being at the commencement of cold weather,—"between hay and grass,"—when cattle generally shrink in weight.

I am feeding my store hogs upon about 10 pounds of Ensilage and one pound of wheat-bran to each animal weighing over 250 pounds. They are doing well, and the cost does not exceed two cents per day. Clover preserved by Ensilage would be excellent, and require no grain added to it. Young pigs are exceedingly fond of the Ensilage.

I feed it occasionally to my work and driving horses. It has as good an effect as an occasional feed of carrots or other roots.

In taking the Ensilage out of the Silo, much labor will be saved by taking it out in vertical slices from the top down to the bottom of the door, removing the weights and

plank covering as fast as necessary. Place the plank on the undisturbed mass in the lower half of the Silo as they are removed from the top, thereby making a floor to stand upon, and to run a car or wheelbarrow upon. When the end of the Silo farthest from the door is reached, commence at that end, dig down to the bottom, throwing the Ensilage with a large fork upon the plank floor, and, by taking out vertical slices, gradually work back towards the door. This floor, which is laid upon the lower half, need not be weighted. There is no necessity for protecting the Ensilage from the air while it is being fed out, as a fresh surface is exposed to the atmosphere each day; and it is so compact, that, if left untouched for three or four days even in warm weather, no injurious fermentation can, or does, take place. It will be warm only on the outer two or three inches. The finer it is cut or shredded, the closer it will pack; and consequently less space will be lost by settling.

CHAPTER XXVI.

ILLUSTRATING THE NUTRITIVE VALUE OF ENSILAGE.

THAT it is a highly nutritious food is proven by the fact that my cows, fed upon it during the winter, brought me very fine, large, strong calves, — upon their feet and sucking almost as soon as dropped. My Vermont Merino ewes sheared upon an average 9 pounds of wool, which I sold for 30 cents a pound at home. They also brought fine, strong, vigorous lambs. The lambs were sired, part of them, by a pure Cotswold ram, and the balance by a pure Oxford down ram. They weighed, when born, from 6 to 12½ pounds each. Some of the Merino ewes bore twins weighing 17½ pounds. My Cotswold ewes did equally well, bringing lambs weighing from 10 to 15½ pounds each when born.

Some of my Cotswold ewes sheared as high as 16 pounds of wool. The whole flock averaged 11 pounds 7 ounces.

My Oxford downs averaged over 12 pounds of wool each. The weight of lambs and of fleeces given above proves that no food could be better for sheep. I have never seen young cattle and calves grow as rapidly in summer upon good pasture as they do in winter in a warm stable and fed upon Ensilage and oil-meal. The mixture is easy to digest; the animal does not have to

work for it; there are no flies to annoy; there is nothing to do but to grow.

I believe colts can be brought forward to maturity in less than two-thirds of the time required to raise them upon summer pasture and the usual winter food.

One thing I wish to impress upon those who contemplate building, and it is this: build strongly and substantially. Silos are not expensive when properly built. They should be built to *last*. The lateral pressure while settling under the weight is very great. A side-hill should always be selected as a site when convenient to the stables. Let the end opposite the door extend into the hill so that the earth will come as near as possible to the top of the wall. It will be more convenient in putting the weights on and removing them. If the side-walls are banked or terraced up on the outside nearly or quite to the top of the walls, all the better.

It will not be necessary for every farmer to buy an engine, or even a cutter. One set of machinery, if sufficiently powerful, will answer for three or four neighboring farmers. Parties who have engines or horse-power for threshing can get a powerful cutter, and add to their season's business by cutting the Ensilage crops, as well as threshing the grain for the farmers of a neighborhood.

CHAPTER XXVII.

CHEMISTRY OF THE SILO.

THAT important chemical changes take place during the curing of green forage plants by the system of Ensilage cannot be doubted. I believe there is a formation of acetic acid to a greater or less extent in *all* cases, and that the acetic fermentation is the first change which takes place. There can be no saccharine fermentation until after acetic fermentation takes place. I doubt its being a saccharine fermentation at all: it is rather a transformation.

I understand the changes to take place as follows: the oxygen of the air in the mass acting upon the sugar in the plant converts that sugar (in corn about 11 per cent) into acetic acid; the acid acts upon the starch (in corn about 56 per cent), and converts it into grape-sugar, or glucose, in much the same manner as sulphuric acid acts upon the corn in the manufacture of glucose. The next stage of fermentation is the conversion of the grape-sugar, or glucose, into alcohol, which, being very volatile, passes off into the atmosphere. Then, and not until then, does real putrid fermentation or decay begin. The previous stages are metamorphoses or changes from one form to another of the elements of nutrition.

If the above is correct, the presence of acetic acid, or sourness, so far from being an injury, is a positive benefit; for without the acid the starch, which is hard to digest, could not be converted into sugar, which is easy to digest.

In alluding to the manufacture of glucose, I am brought to consider the relative value of different varieties of corn. As it matters but little whether the corn at the time it is cut contains sugar or starch (chemically they are almost identical), as the sugar which exists in the plant is converted into acetic acid, while the starch is converted into sugar, it follows that the variety which will produce the greatest amount of sugar *and* starch to the acre is the best; that sweet corn (which has been so highly extolled as a forage crop, and justly, perhaps, if fed fresh from the field) does not produce as much sugar *and* starch or ultimate sugar, is proven by the fact that the managers of glucose factories do *not* recommend the planting of sweet corn. Were it otherwise, they would be as particular about the variety of seed-corn planted that it should be sweet corn, as the managers of beet-sugar factories are that the farmers who raise sugar-beets for them procure the seed from them.

As a general rule, that variety of corn which grows the largest, which produces the greatest number of tons to the acre, is the best. In some of the Southern States pearl millet may prove superior to corn. In Ensilaging it, I think, it would be well to cut it just before it heads. In the whole Southern region the field-pea should not be overlooked. It has an excellent effect upon the soil, and upon good land will yield an enormous crop. It is a plant which draws much of its nourishment from the atmosphere.

Rape, I am inclined to think, might prove a valuable forage crop, especially winter rape. It might be sown before the corn is cut, and would doubtless make a heavy growth before the hard frosts. It would shade and protect the ground from washing, and furnish good pasturage in the fall for sheep. In the spring it could be cut and packed in the Silo, or turned under as a green manure. The expense for seed would be much less than for winter rye or oats.

In many sections the heavy crops of weeds which grow upon fallow lands might be mowed before they become too hard, and packed in Silo. They would make an excellent food for sheep at least a portion of the time. If cut when very green and succulent, they might be mixed with oat or even wheat straw, and thereby convert the straw into a very good quality of forage.

CHAPTER XXVIII.

HOW TO RAISE THE MAXIMUM CROP OF FODDER CORN.

A GREAT amount of labor is lost by sowing fodder corn too thick, as well as a large amount of seed wasted. Many sow three bushels to the acre; some sow but two bushels; and a few sow but one. I sow but one-half bushel, and my corn is always too thick. The man who has raised the largest crop the past season sowed but 12 quarts of seed to the acre. Make the drills at least four feet apart, and sow one-half bushel of Mammoth Ensilage seed-corn to the acre; then, when it is about a foot high, thin it to 6 and 8 inches between stalks, and I can assure you, with a good corn season, if the land is suitable for corn, is well manured and given frequent cultivation, a crop weighing from 40 to 75 tons to the acre. When corn is planted too thick, those plants which do not attain their full growth are nothing more than weeds. As dirt is only matter out of place, so a weed is only a plant out of place. No plant is so far out of place as when it is crowded by other plants of the same kind so that its growth is impaired: it then becomes a mere weed, and only serves to injure the growth of the proper number of plants in the hill or drill.

CHAPTER XXIX.

NEW FORAGE PLANTS AND NEW USES FOR ENSILAGE.

IN concluding this new edition, let me urge all enterprising farmers to try experiments in raising the various forage plants; especially let us seek for a plant which will grow during the fall and spring months, and yield a crop approximating the yield of corn. There are many weeds, biennials, which make their principal growth in the fall months of the first season and the early months of the second season, reaching their full growth in season to grow corn. They might become very valuable to grow upon light lands which suffer severely by the drought in the summer months. Why may not hybridization do as much to improve our forage plants as it has to improve our vegetables and small fruits, and to clothe with new beauties the common garden flowers of half a century ago?

I believe that we are upon the eve of an entire change in preserving not only forage plants for our domestic animals, but that the true way to preserve herbs is to gather them fresh, and press them into tight jars or cans, and hermetically seal them; also that *tea* might and will be preserved in small sealed cans with all its delicate flavors and aroma unimpaired by exposure to the atmosphere during the process of curing by drying. To cure

tea properly is by far the most expensive item in tea-culture. It can only be profitably raised where labor is very cheap. The tea-plant grows well and flourishes in California, and in many localities of the South; but we cannot compete with Asiatic labor at 4 to 6 cents per day in curing it. If it can be preserved in jars or cans in its green state, so compacted as to expel all the air, and sealed so as to prevent evaporation and fermentation or change, it is very possible that the culture of tea in our own country may become a profitable pursuit: the product, too, may be superior. Herb-tea is much better made with the freshly gathered plant than when the dried herb is used. I trust that those who are experimenting with the tea-plant in the South and on the Pacific coast will test the preservation of tea by Ensilage.

ANY ADDITIONAL INFORMATION WHICH MAY RESULT FROM MY EXPERIMENTS, AS TO THE BEST METHODS OR MACHINERY FOR ENSILAGING, WILL BE CHEERFULLY FURNISHED UPON REQUEST, ENCLOSING STAMP.

Bailey's Patent Practical Tree Trimmer.



By the use of this new pruning implement, fruit trees of all kinds can be carefully and symmetrically pruned without leaving the ground. The operator can see what he is doing, and prune three trees with less labor and in less time than one can be trimmed with other pruning implements which require ladders and necessitate climbing. Limbs of any size up to two or three inches cut with a few blows of the sliding hammer, which the operator grasps in one hand. **Price, \$2.50.**

Manufactured by the **Remington Agricultural Company**, Ilion N. Y., and for sale by all dealers in Agricultural Implements, and by

JOHN M. BAILEY, "Winning Farm," Billerica, Mass.

"MAMMOTH ENSILAGE"

(JOHN M. BAILEY'S TRADE MARK.)

SEED CORN

Will yield from 40 to 75 tons to the acre; is more succulent; contains more sugar, and has more luxuriant foliage than any other variety.

J. G. Walcott, of Peabody, had Mammoth Ensilage fodder corn the past season, from seed bought of me, which yielded at the rate of **72 tons** to the acre. Some of the stalks were 19 feet 6 inches tall, and weighed over 12 pounds each.

Only *one-half* bushel required to plant an acre. All report the yield much greater than with any other kind of seed.

A large quantity of MAMMOTH ENSILAGE SEED CORN, expressly for ensilage, price by mail 50 cents per pound, three pounds \$1.00; by freight or express, \$1.25 per half peck, \$2.00 per peck, \$3.00 per half bushel, \$5.00 per bushel; \$4.00 per bushel in lots of two bushels or more. No charge for bags. Plant from May 20 to July 10, in drills 4 feet apart. Manure heavily.

I sold over 200 bushels of Mammoth Ensilage Seed Corn last year, and although I have raised the past season over 500 bushels, those who want Mammoth Ensilage will do well to order soon, for at the rate orders are coming in it will all be taken before planting time.

I raised more from one acre planted with Mammoth Ensilage than from three acres of Southern White — all manured and cultivated alike.

B. C. PLATT, Suffield, Conn.

Our Fodder Corn from your Mammoth Ensilage seed yielded a much greater weight than other kinds.

J. C. POOR, North Andover, Mass.

The Mammoth Ensilage is far superior to any other kind.

H. R. BARKER, Lowell, Mass.

The above are selected from a large number of testimonials. Send for circular and catalogue.

JOHN M. BAILEY,

"Winning Farm," Billerica, Mass.

— OR —

"Virginia Stock Farm," Waverly, Sussex Co., Va.

JOHN M. BAILEY,

BREEDER OF

Shorthorn and Jersey Cattle, Cotswold, Oxfordshire Down,
Vermont Merino, Cotswold Merino, and
Oxford Merino Sheep.

The "Winning" flock of Cotswolds was formed by selecting *all* the *best* sheep in the Mapleshade flock, belonging to Joseph Harris, Rochester, N. Y. (6 first premiums at New England Fair, 1880.)

The Oxfordshire Downs are from the flocks of John Treadwell and A. J. Milton, Druce, England.

The "Winning" Merinos are from the best flocks of Vermont.

In the Cotswold and Oxford Merino there is to be found the most profitable sheep for mutton and wool in the world. For full description and history of these crosses send for illustrated catalogue. Mailed to all enquirers.

A SPECIALTY MADE OF HIGH CLASS BERKSHIRES.



"WINNING BELLADONNA."

(IMPORTED.)

Winner of the First Prize at New England Fair, 1880.

The "Winning" Berkshires are all from imported stock, which was bred by the celebrated English breeders, Swanwick, Humfrey, Stewart, and Bailey.

Pigs of all ages, with perfect pedigrees, from \$5.00 upwards. Boars fit for service and Sows with pig, at reasonable prices.

Send for Illustrated Circular and Catalogue.

P. O. ADDRESS :

"WINNING FARM," BILLERICA, MASS.

—OR—

"Virginia Stock Farm," Waverly, Sussex County, Va.

Joseph Breck & Sons

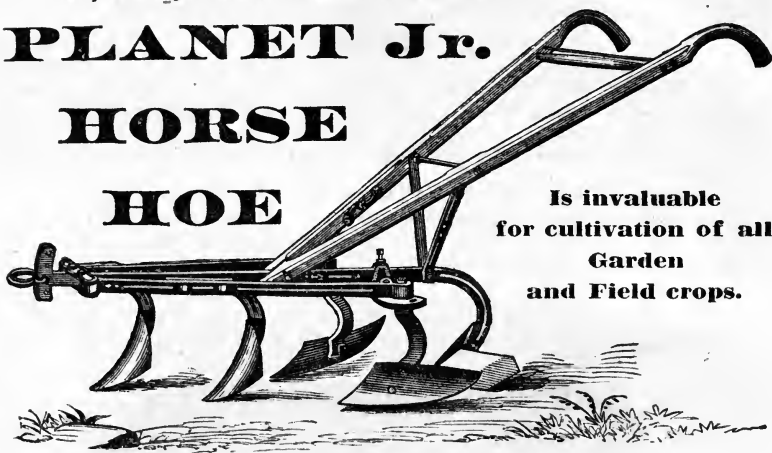
Are making a Specialty of all MACHINES, IMPLEMENTS and SEEDS that are especially adapted to the requirements of the Ensilagist, and solicit correspondence on the subject.

The following articles are almost indispensable :

PLANET Jr.

HORSE

HOE



**Is invaluable
for cultivation of all
Garden
and Field crops.**

— ALSO, —

The "Advance" Chilled Plow and Thomas' Pulverizing and Smoothing Harrow,

For Preparing the Land;

Pearce's Improved Broad-Cast Seed Sower, Albany Corn and Seed Planter,

For Sowing the Seed;

Whitman's Improved Railway Horse Power,

For operating the Ensilage Cutter;

— AND —

The Lightning Hay and Ensilage Knife,

For cutting down Ensilage in the silo.

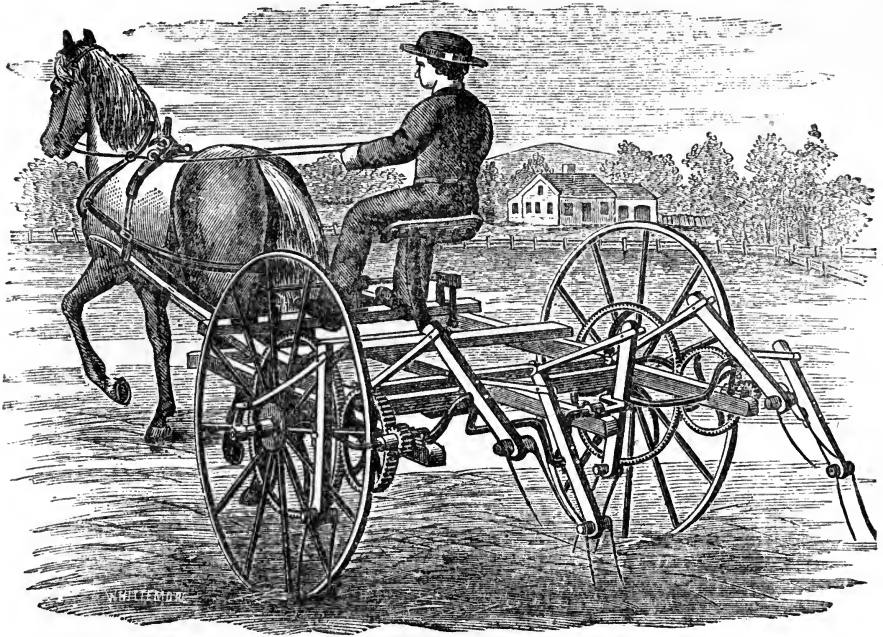
We shall be happy to mail descriptive circulars and quote prices on any of the foregoing articles. Also, our catalogues of Garden, Grass and Field Seed, and of Machines and Implements, are valuable as text books, and we furnish them free on application.

Joseph Breck & Sons,

51, 52 and 53 North Market Street,

BOSTON, MASS.

The Bullard Hay Tedder.



The BULLARD TEDDER has outlived scores of experimental machines, and is to-day better appreciated than ever before. Many different devices have been brought forward for turning grass, but nothing else has stood the test of practical farming but the crank motion and the movement of the forks that almost exactly reproduces the plunging swing of the fork in the hands of a brisk man. A glance at the cut will show that this movement in the BULLARD TEDDER is done at the rear of the machine, the end forks being outside the wheels. Thus the wheels never run over the teded hay. Every particle of the grass is lifted, tossed and shaken out from the bottom and left light and open to air and sun. It will do the work of from six to eight men, is very light draft, and is strong and durable.

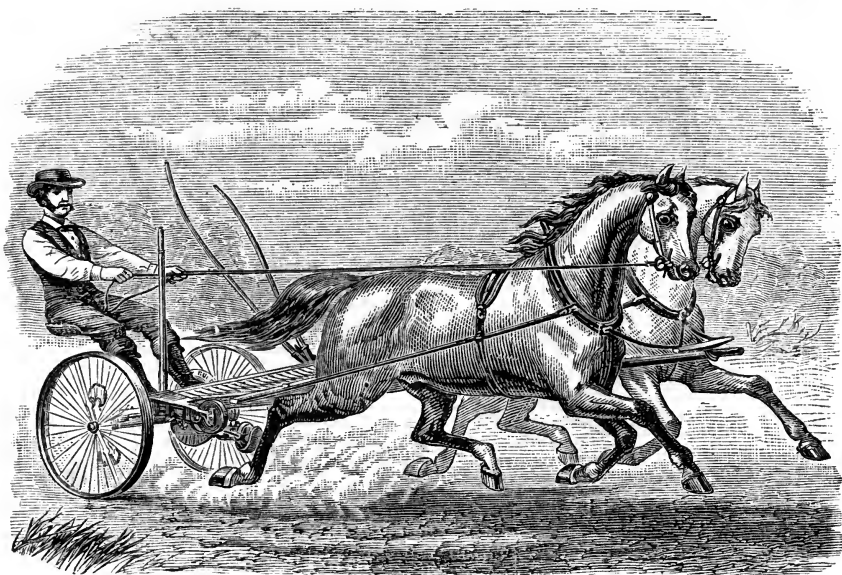
MANUFACTURED BY

THE RICHARDSON MFG. CO.

WORCESTER, MASS.

THE STANDARD

New Model Buckeye.



The BUCKEYE has stood the test of twenty-five years, and maintains the place it has earned as *the Standard Machine of America*. These many seasons of use have established it as the best in its principle, and the strongest and most durable in construction. It has been kept up with the times to meet every demand of the hay field, and constantly improved in the direction of greater *simplicity*.

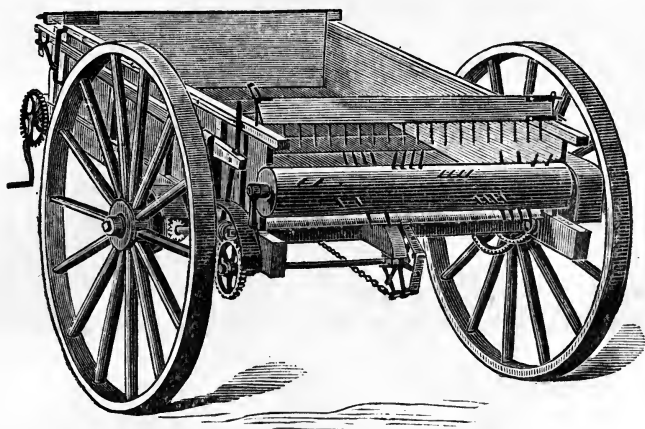
The *New Model Buckeye* is so simple in its mechanism that the most unskilled can use and keep it in order. While these improvements have greatly lightened and simplified the BUCKEYE, the old reliable features of *strength and durability* still remain.

MANUFACTURED BY THE

RICHARDSON MANUFACTURING CO.

WORCESTER, MASS.

KEMP'S PATENT MANURE SPREADER.



This Machine is the most valuable invention ever offered to the farmer, as it saves labor, does its work better than it can possibly be done by hand, and can be used the season through for any purpose where a farm wagon is used.

It will spread all kinds of Manure, from the roughest and toughest down to the finest, including ashes, in all conditions, wet or dry, and the time required to spread a load is from one and a half to two minutes, without manual labor.

It is regulated to spread different quantities to the acre, so that the farmer knows just what amount of Manure he is using per acre.

It has been fairly demonstrated in the past two seasons, from experiments made by parties owning these carts, that its use *increases the crop from 20 to 30 per cent.* and that Manure spread by this cart is worth *One Dollar per Cord more*, owing to its fine and even distribution.

It can be attached to the Fore Wheels of an ordinary Farm Wagon.

MANUFACTURED BY THE

Richardson Manufacturing Co.,

WORCESTER, MASS.



Fairbanks' Standard Scales.

Absolute Accuracy, Unvarying Accuracy, Sensitive Action, Durability,

Are the necessities of a perfect Weighing Machine.

ALL THESE REQUISITES ARE TO BE FOUND ONLY IN

FAIRBANKS' Standard Scales.

They are made in every variety, adapted to all uses, and with

EVERY IMPROVEMENT

which the skill and experience of a half-century in the business can suggest.

MANUFACTURED ONLY BY

E. & T. FAIRBANKS & CO.

ST. JOHNSBURY, VT.

—ALSO,—

Miles' Alarm Tills, or Safety Money Drawers,
Store Trucks, Coffee Mills, The Type
Writer and Lawn Mowers.

FARM SCALES FOR BARN, OR THE YARD, ALSO FOR DAIRY USE.



WAREHOUSES:

83 Milk Street, Boston, FAIRBANKS, BROWN & CO.

311 Broadway, New York, FAIRBANKS & CO.

STOCKBRIDGE MANURES.

SEND FOR NEW PAMPHLET. MAILED FREE.

Seven years ago the Stockbridge Manures were only known to a few farmers in the Connecticut Valley. Now they are so extensively used in the Atlantic States as to require two large factories, one in Boston and one in New York, to manufacture them. This increase shows what farmers think of good fertilizers, and is not only due to the fact that they are reliable, well-made, and high-grade manures, but also to the fact that farmers have found them

PROFITABLE TO USE.

And now that corn and other farm produce is bringing good prices, such as were seldom realized during the war, considering they are now on a *gold basis*, farmers will therefore find these manures *still more profitable to use.*

ALSO, MANUFACTURERS OF

BOWKER'S **HILL**
AND
DRILL PHOSPHATE.

The Best and Cheapest Sold

ALSO FOR SALE,

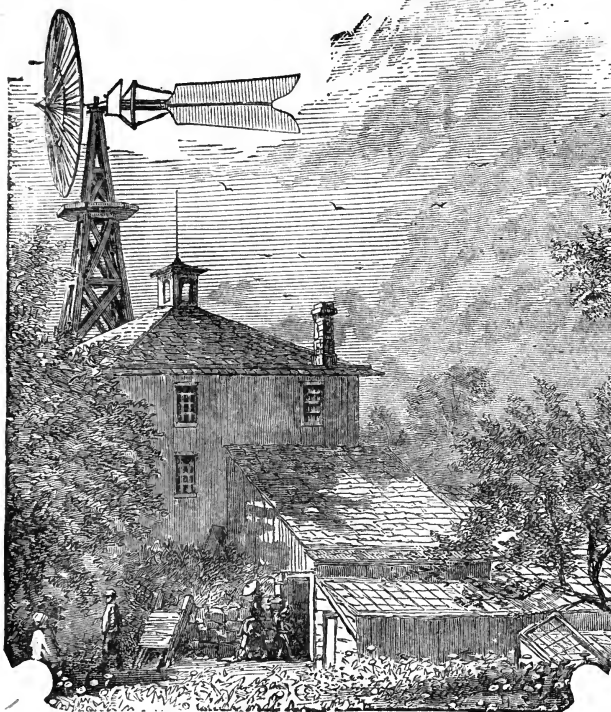
Agricultural Chemicals, Ground Bone, &c.

BOWKER FERTILIZER CO.,

43 Chatham Street, Boston, or

3 Park Place, New York.

WHEELER'S "ECLIPSE" WIND-MILL.



View of the Eclipse Wind-Mill of James Vick, Esq., whose letter we give below.

Mr. L. H. WHEELER, 40 Oliver Street, Boston:

ROCHESTER, N. Y., April, 1879.

Dear Sir,—Having had in use one of your 16-foot Wind Engines since 1875, I can certify to its power and efficiency. During this time it has **never been out of repair**, and is to-day in as good working order as when first erected.

While many mills of other makes in this vicinity have been wrecked by gales, I find the Eclipse perfectly self controlling, and it does not suffer the slightest injury from our severest winds. It furnishes a full supply of water for five Greenhouses, House, Stable, and for irrigating purposes for about fifteen acres, through which runs several thousand feet of distributing pipe. With medium wind we raise twenty to thirty barrels per hour, twenty-five feet lift. In short, the working of the mill is so satisfactory that no change is desired. A smaller mill would do our work, or the one we have would run two such pumps as we are using.

JAS. VICK.

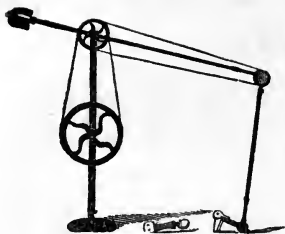
Our geared wind-mills are meeting the wants of many who need some power for running machinery, sawing wood, grinding grain, and cutting fodder for ensilage. Prices range from \$70 to \$1500.

Below we give the names of a few of our patrons who are well known to the public:

STATE NORMAL SCHOOL, Framingham.	Dr. DIO LEWIS,	Arlington Heights.
JORDAN, MARSH & Co.,	C. H. FISK,	Stony Brook.
RICHARD NELSON,	Dr. CHARLES CULLIS,	Walpole.
W. S. PHELPS,	W. HEUSTIS,	Belmont.
WM. H. WRIGHT,	W. CHENERY,	"
W. H. SIMPSON,	C. FAIRCHILD,	"
LUTHER FULLER,	H. SAWYER,	Concord.
LEE HAMMOND,	BATES ESTATE,	Watertown.
HARVEY D. PARKER,	JOHN CASSIDY,	"
WM. E. BAKER,	LAMON & SONS,	Nantasket.
G. W. HOLLIS,	FRANK JONES,	Portsmouth.
A. D. PHILBRICK,	E. H. WINCHESTER,	"
J. H. CLAPP,	PIERCE ESTATE,	"
J. M. BRANT,	Dr. PILLSBURY,	Lowell.
JOHN LANE,	R. H. BARKER,	Boston.
JAMES ALLEN,	J. WARREN MERRILL,	"
JAMES S. EDWARDS,	G. D. GILMAN,	"
	Quincy.	

We have given the above names for reference. There are hundreds of these Mills in New England.

For full particulars and Circulars, apply to L. H. WHEELER, 40 Oliver St., Boston, Mass.



American Shearer Manuf'g Co.

Manufacturers of Power and Hand

HORSE CLIPPING MACHINES,

NASHUA, N. H.

ALSO, THE

ONLY RELIABLE AND SUCCESSFUL

Sheep Shearing Machine

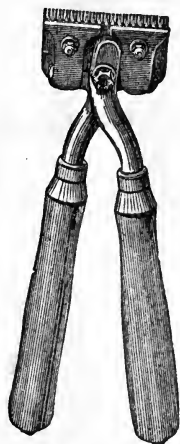
That has ever been put upon the market.

NO ROYALTY.

The Centennial Award was given at Philadelphia Exposition,

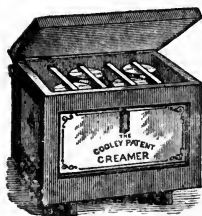
AND AT

State Fairs when Exhibited.



No. 5 Hand Horse Clipper.

COOLEY CREAMER.

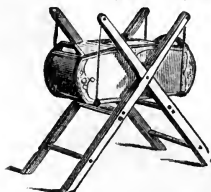


Gold Medal, Paris, 1879. Butter made by this process awarded Sweepstakes at International Dairy Fair, 1878, and Gold Medal and First Premium at the same fair, 1879; First Premium at Royal Agricultural Exhibition, London, 1879.

It requires no milk-room; it raises all of cream between milkings; it affords better ventilation; it requires less labor; it is more thoroughly made; it is cheaper, and gives better satisfaction than any other way of setting milk. The Butter made by this system is unequalled in its keeping qualities.

Over eight thousand of these Creamers are now in use, and give the best of satisfaction. The best dairymen of the country use and recommend them, including Ogden Farm, Newport, R. I., Echo Farm, Litchfield, Conn., Winning Farm, Billerica, Mass., Lawrence Farm, Groton, Mass., T. S. Cooper, Coopersburg, Penn., Hiram Smith, Sheboygan Falls, Wisconsin, Holley Grove Farm, Plainfield, N. J., and many others.

DAVIS SWING CHURN.



Awarded First Premium over all competitors at only practical test ever held at International Dairy Fair. The box contains no floats or inside gear, which mash the butter-globules; no corners in which the cream can lodge to be washed into the buttermilk and lost when the butter separates. The butter gathers in beautiful granules, in the best possible condition for washing in the churn with cold water and brine. This Churn needs only to be seen to be appreciated. Is easiest to work; easiest to clean. Sales are increasing fast where they have been introduced.

MANUFACTURED BY

THE VERMONT FARM MACHINE CO., Bellows Falls, Vt.

Illustrated Circulars sent on application.

VICTOR FIVE-HOED ONE-HORSE GRAIN DRILL.

For Sowing Wheat, Rye, Oats, Barley or Peas in
Fallow Ground or between Standing Corn.

Manufactured by EWALD OVER, Indianapolis, Ind.

PRICE, \$25.00.



It sows five drills at the same time. The two outer hoes on each side are placed on two swinging wings of the frame, which, by means of the lever between the handles, can be expanded and contracted to suit the different widths wanted. The distance between outer teeth at greatest contraction is 27 inches, and at greatest expansion, 34 inches.

This implement ought to be in the hands of every farmer in the land. Although owners of large tracts of land may be compelled to use the two-horse drills, still they can use it for sowing wheat or rye in standing corn. Farmers who have but few acres to sow, can use this implement and save thereby the expense of a two-horse drill, and get all the advantages of drilling over broadcasting. Extra cups furnished to sow peas, beans or corn, if desired. Its weight is only 125 pounds, making it an easy draft for one horse. By closing up the intermediate holes you can sow three drills from 13½ to 17 inches apart. From 1 to 1½ bushels of seed sowed to the acre, and as good a stand secured as when 2 bushels are sowed by hand. 37½ to 50 per cent. in amount of seed saved, which will pay for the machine every 20 or 25 acres sowed, a better crop secured, and much labor saved. Orders from parties in New England may be addressed to

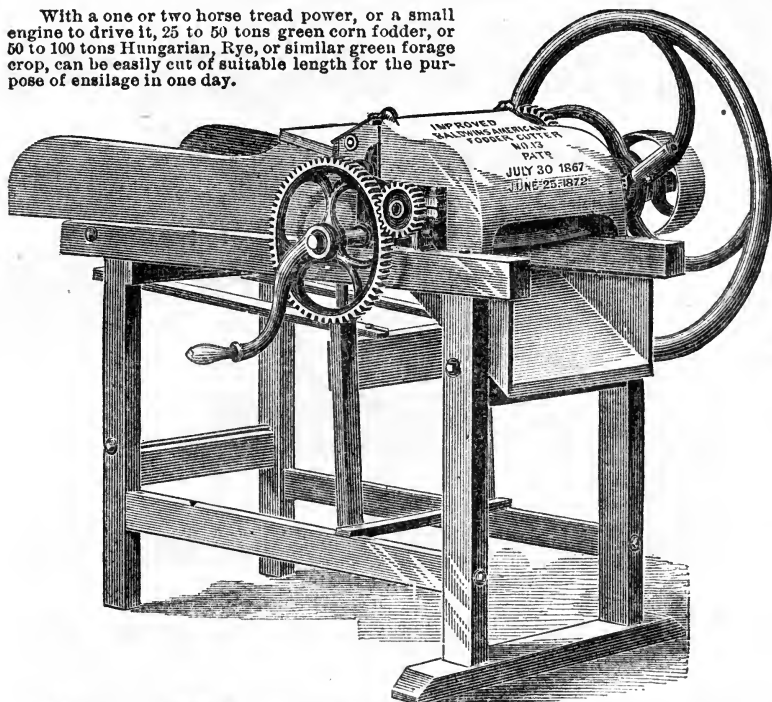
JOHN B. BAILEY,
BILLERICA, MASS.

They will receive prompt attention, and save freight charges.

IMPROVED BALDWIN'S American Fodder Cutter.

Especially adapted for Ensilage.

With a one or two horse tread power, or a small engine to drive it, 25 to 50 tons green corn fodder, or 50 to 100 tons Hungarian, Rye, or similar green forage crop, can be easily cut of suitable length for the purpose of ensilage in one day.



The above cut represents one of the smaller sizes of the Improved Baldwin Fodder Cutter. Before the great demand was created for ensilage cutters in 1880, this machine was known for many years as the best cutter in the world for cutting hay, dry corn fodder, paper, rags, etc., and our claim that it would prove the best ensilage cutter has been thoroughly sustained by the entire satisfaction it has given the hundreds of persons who have used these machines for this purpose. We give below a few of the many testimonials we have received from parties using them for cutting ensilage.

WEYMOUTH, MASS., October 15, 1880.

The "Baldwin Hay Cutter," No. 15, purchased of you, is all that I could wish. I used it in cutting heavy corn fodder for ensilage: it performed the work well and rapidly, cutting two tons per hour, so fast that it required two men to feed it. I can recommend it to any one desirous of having a good cutter.

Very truly yours, F. E. LOUD.

HALLOWELL, ME., October 15, 1880.

The Baldwin Fodder Cutter gives me entire satisfaction. I believe it is the best fodder cutter in use.

Yours truly, J. R. BODWELL.

• These machines are built of the best materials, and in the most thorough manner, and are of great strength, simplicity and durability. Each cutter that is arranged for power is supplied with the patent safety fly wheel, by which entire safety is secured to operators and machine when in operation. *Descriptive circulars mailed on application.*

Manufactured for and for sale by

JOSEPH BRECK & SONS,

51, 52, and 53 North Market St., - - - Boston, Mass.

Joseph Breck & Sons

Are making a Specialty of all MACHINES, IMPLEMENTS and SEEDS that are especially adapted to the requirements of the Ensilagist, and solicit correspondence on the subject.

The following articles are almost indispensable :

PLANET Jr.

HORSE

HOE



Is invaluable
for cultivation of all
Garden
and Field crops.

— ALSO, —

The "Advance" Chilled Plow and Thomas' Pulverizing and Smoothing Harrow,

For Preparing the Land;

Pearce's Improved Broad-Cast Seed Sower, Albany Corn and Seed Planter,

For Sowing the Seed;

Whitman's Improved Railway Horse Power,

For operating the Ensilage Cutter;

— AND —

The Lightning Hay and Ensilage Knife,

For cutting down Ensilage in the silo.

We shall be happy to mail descriptive circulars and quote prices on any of the foregoing articles. Also, our catalogues of Garden, Grass and Field Seed, and of Machines and Implements, are valuable as text books, and we furnish them free on application.

Joseph Breck & Sons,

51, 52 and 53 North Market Street,

BOSTON, MASS.

Ensilage Cutter.

(Trade Mark of the N. Y. Plow Company.)

Combines great rapidity with strength, durability and simplicity of parts. It has four spiral knives of heavy cast steel. The length of cut is easily changed. The two rollers open both parallel and obliquely, and cannot be clogged. The cylinder revolves without jar, and cuts with exactness. The mouthpiece is of hard steel, with its cutting edge planed, and the knives cut *upward*, which is essential to safety. It has tight and loose belt pulleys and babbitted boxes.

We have made a special study of Cutters for Ensilage, and claim to know about them.

No. 1. —Length of knives, 12 inches. Length of cut, 4-10, 8-10 in.	
Price,.....	\$75.00
No. 2. —Length of knives, 15 inches. Length of cut, 3-10, 4-10, 5-10, 7-10 in. Diam. pulleys, 22 in. Weight of balance wheel 150 lbs. Will cut 2 tons dry or 4 tons green stalks per hour.	
Price,.....	125.00
No 3. —Length of knives, 18 inches. Length of cut, 2-10, 4-10, 6-10, 8-10, 1 2-10 in. Weight of balance wheel, 400 lbs. Diam. pulleys, 26 in. Will cut 4 tons dry or 8 tons green stalks per hour. This cutter is now in use by the largest ensilagist in the United States. Price,.....	250.00
Extra for Elevator,.....	15.00
Smaller Cutters for power,.....	\$25.00 and 60.00
“ “ “ hand,.....	\$7.00, \$9.00, \$15.00, \$20.00 and 35.00

MANUFACTURED BY

THE NEW YORK PLOW COMPANY

55 Beekman St., New York.

WE ALSO MANUFACTURE

Adamant (Hard Metal) Plows, and all other kinds of New York and Boston Plows, and repairs for same, Strong Sub-Soil Plows, Corn and Cabbage Plows, Hilling Cultivators, Disk Harrows, Corn Planters, Field and Garden Rollers, Corn Stalk Mowers and Droppers, Corn Shellers, Root Cutters, Cider Mills, Copper Strip Feed Cutters, Lawn Mowers, Press Screws and Manure Spreaders.

CIRCULARS FREE AND CORRESPONDENCE SOLICITED.

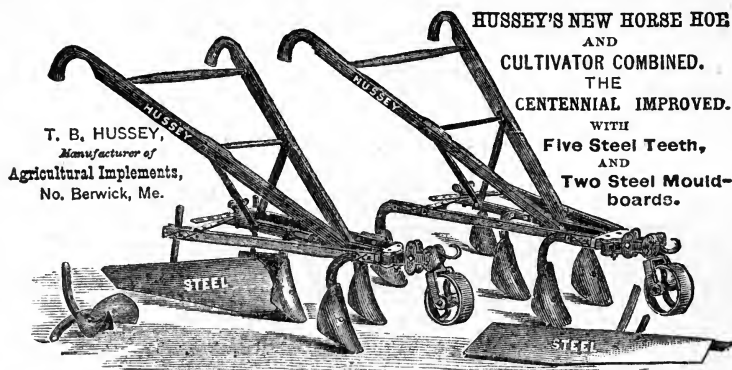
T. B. HUSSEY,

MANUFACTURER OF

P L O W S

— AND —

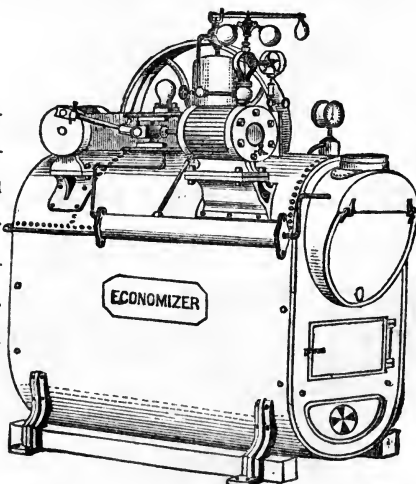
CULTIVATING IMPLEMENTS.



The Economizer Portable Engine.

Is the most complete, simple, durable, and economical Steam Engine, for Farm and Agricultural purposes, known.

Over six hundred now in use.

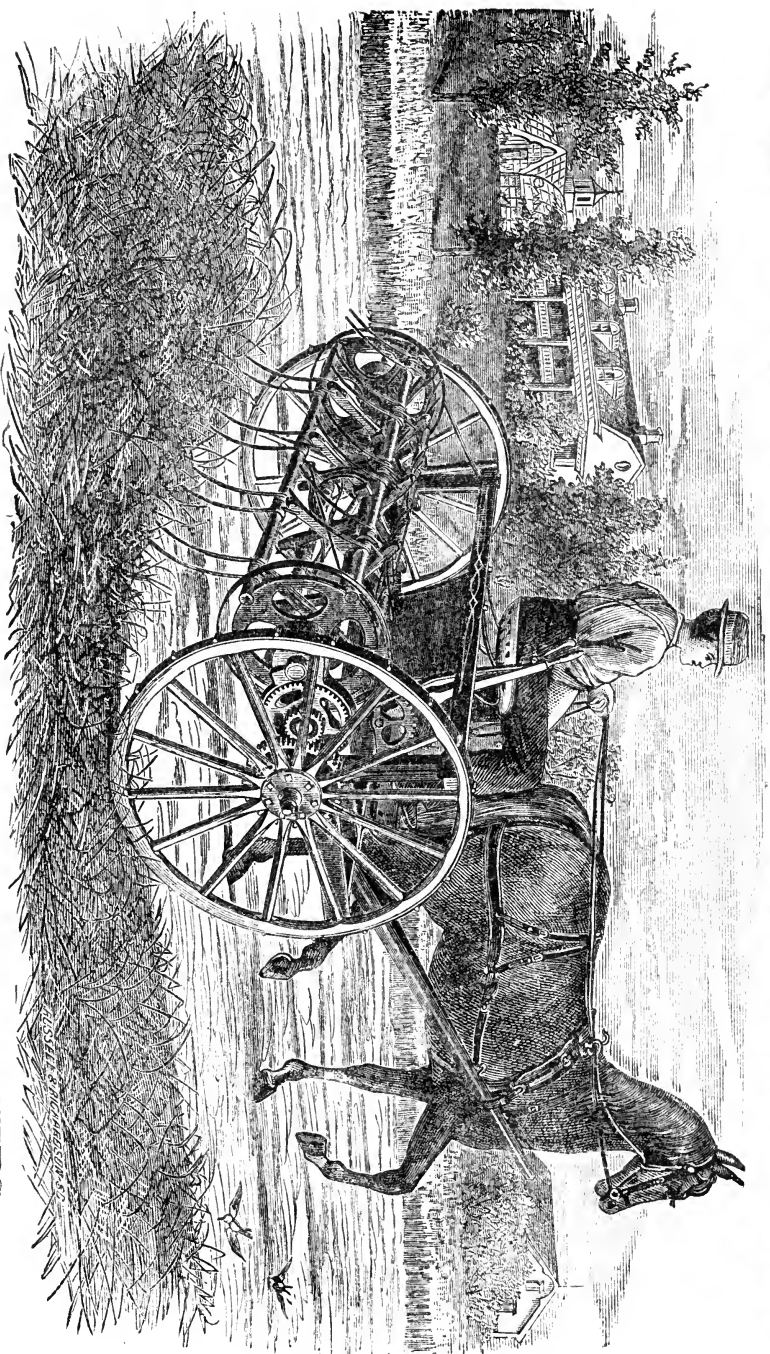


All its parts are accessible for cleaning. Its boiler has no dangerous crown-sheet, therefore can be operated with inexperienced help.

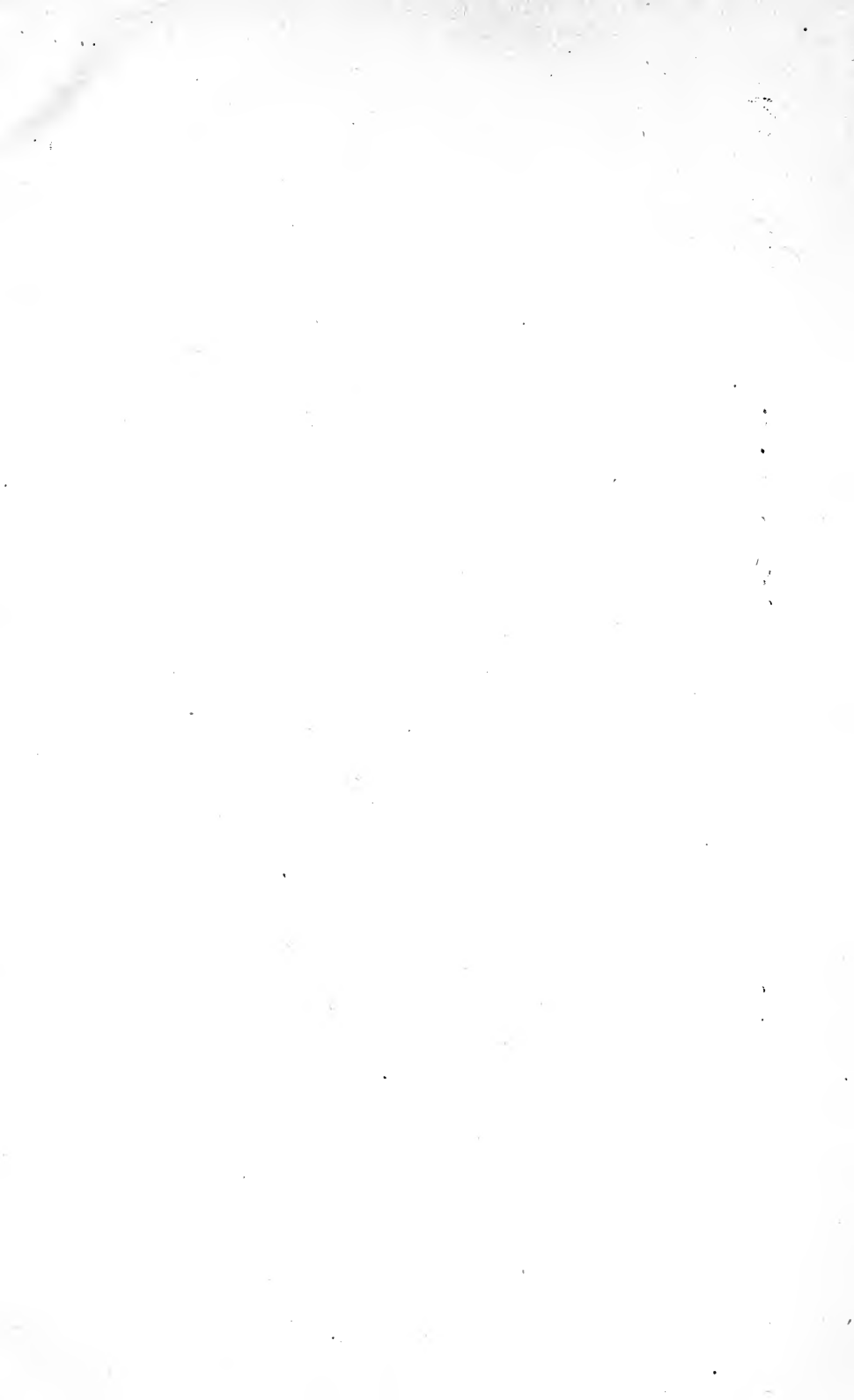
Send for illustrated circular and prices.

S. L. HOLT & CO.,
No. 67 Sudbury Street, Boston.

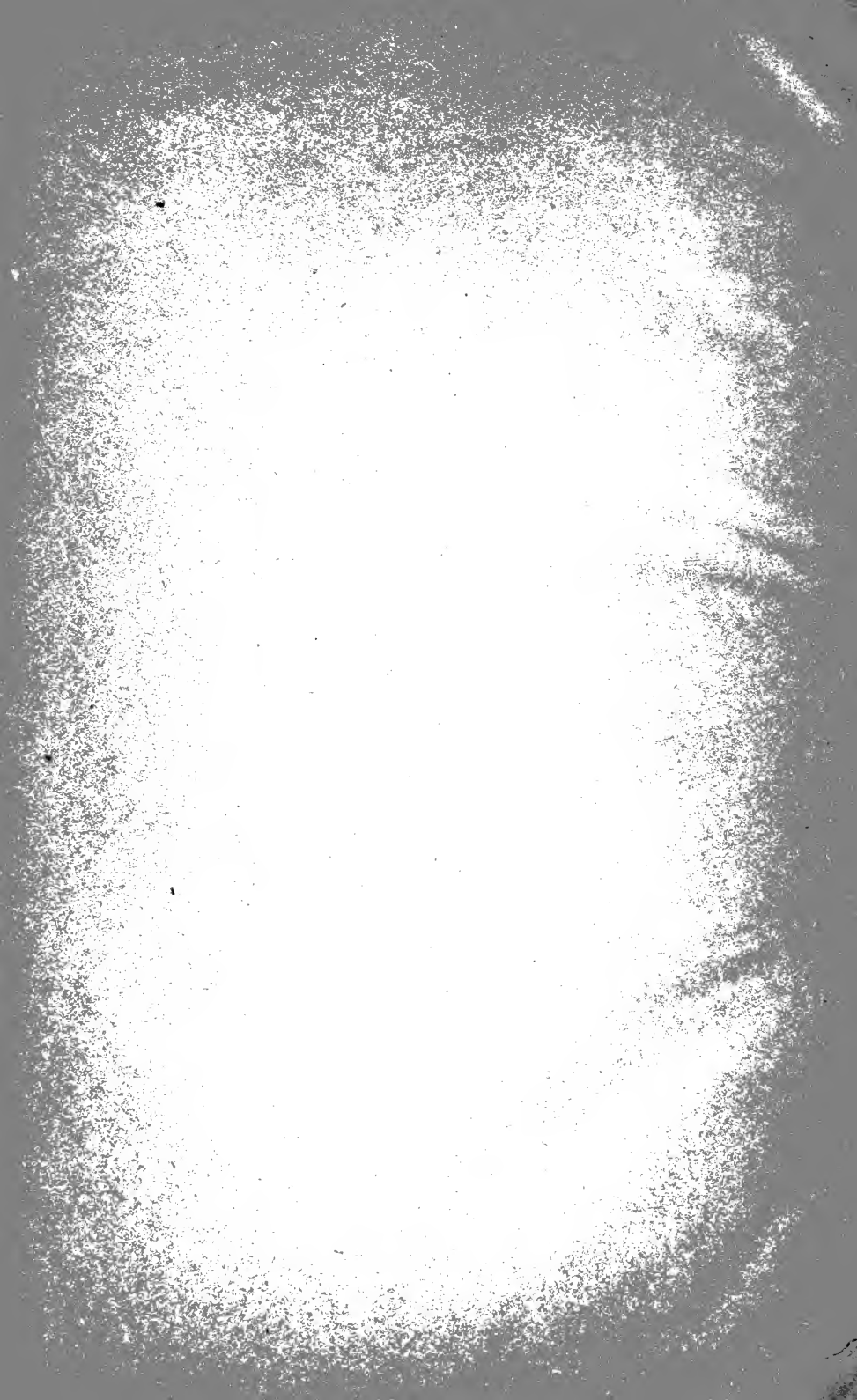
NEW "THE AMERICAN" HAY TEDDER.



AMES FLOW CO., BOSTON, MASS., SOLE MAKERS.









**GENERAL LIBRARY
UNIVERSITY OF CALIFORNIA—BERKELEY**

RETURN TO DESK FROM WHICH BORROWED

**This book is due on the last date stamped below, or on the
date to which renewed.**

Renewed books are subject to immediate recall.

13 Nov '55 W 8

OCT 8 1955 11



